NTT DATA

**Version 1.3**

# Geospatial Roadway Inventory Database User Guide

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# Revision History

This revision history is updated each time this document is updated. The history identifies the version number, the date the version was completed, the author of the changes, and a brief description of the changes.

| Version | Effective Date | Description of Change | Affected Section(s) | Prepared By |
|---|---|---|---|---|
| 1.3 | 10/10/16 | Minor improvements to framing around screenshots throughout; note added about required fields | 6.3 | Eric Guthrie |
| 1.2 | 9/22/16 | GRID V1.3 showing effects of HTML5 update to the UI; Version 1.2 skipped to align GRID application and User Guide version numbers (1.3). | Most | Eric Guthrie |
| 1.1 | 10/14/15 | Additional edits and clarifications from TPP. | All | M. Hiland, J. Bierman, A. Davidson |
| 1.0 | 9/16/15 | Incorporated review comments. Ready for submittal to TxDOT. | All | J. Kiley, M. Hiland |
| 0.g | 8/27/15 | Incorporated review comments and sent back for another review. | All | J. Kiley, M. Hiland |
| 0.f | 8/25/15 | Accepted all changes. Ready for peer and QA review. | All | M. Hiland |
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| 0.c | 8/23/15 | Rewrote introduction. Revised content flow, heading levels, and ToC. Added GRID Admin content. | All | T. Taylor |
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| 0.a | 7/13/15 | Initial Draft | All | J.Kiley |

# Section 1. Introduction

The Geospatial Roadway Inventory Database (GRID) is an application created by the Texas Department of Transportation (TxDOT) to maintain TxDOT's roadway network and roadway asset inventory data.

GRID is a web application that replaces legacy TxDOT mainframe applications with a database and mapping services for detailed location identification. GRID's map-based interface enables you to identify and edit data about an exact segment of a route.

GRID uses linear referencing to locate features on routes. A **Linear Referencing System** (LRS) is a method of spatial referencing, in which the locations of features are described in terms of measurements along a linear element, from a defined starting point. In essence, LRS represents a route as a line and provides the means for referencing an exact location along the route. The **Linear Referencing Methods** (LRMs) used in GRID include:

- Route Coordinate (latitude and longitude)
- Distance from Origin (DFO)
- Texas Reference Marker (TRM) + offset
- Control Section Milepoint (CSM)

GRID comprises four main modules:

- **GRID Launch** (Launch) provides the initial screen from which a user can enter the other modules and receive system notifications.
- **GRID Administration** (Admin) allows authorized users to grant and revoke access to and privileges in GRID.
- **GRID Maintenance Application** (GMA) provides the bulk of the data maintenance functionality. GMA is logically split into two sub-modules:
    - **Linear Referencing System** (LRS) provides functionality to edit secondary route definitions, control sections, and reference markers.
    - **Roadway Asset Inventory** (RAI) provides functionality to edit inventory data about the roadways.
- **Bulk Loading/Extract, Transform, and Load** (ETL) provides functionality to upload changes to the underlying roadway geometries and primary route definitions. Access to this module requires special privileges and is not discussed in this document.

All data maintenance work in GRID is completed within a job. A job describes, either generally or specifically, work that needs to be performed on a particular portion of the roads. A person with appropriate privileges creates a job and assigns it either to another GRID user or to him/herself.

When a user starts work on a job, a single route or portion of a route is locked to prevent other users from making conflicting edits.

There are two types of jobs in GRID: Roadway Asset Inventory (RAI) jobs and Linear Referencing System (LRS) jobs. When you complete an RAI job, you are adding, updating, or deleting one or more of the RAI assets along a route segment. Examples of an RAI asset include speed limit, roadway status, and culvert.

When you complete an LRS job, you are adding, updating, or deleting a secondary route definition, a control section, or a reference marker.

All route linework or geometry updates are uploaded into GRID using an ETL process. Geometry cannot be edited in GRID.

As a cloud-hosted application, you can access GRID through a standard web browser connected to the TxDOT domain. The GRID Launch page provides entry to the GRID application. This page displays notifications and icons for launching the GRID modules. The icons you see depend on your access permissions.

## 1.1 GRID User Roles

In GRID, different user roles grant permissions to make data edits, assign jobs, and/or review and approve jobs. Depending on your role assignment, you can work with jobs involving all roadways in the state of Texas or only those roadways within a particular district. The GRID system administrator assigns the user roles in the GRID Administration module.

Because GRID must provide different functionality for several different types of users, it is imperative to define these roles and describe their differences. There are five distinct roles.

The following sections describe each role and their operations within the application.

| | TPP | | Non TPP | | |
|---|---|---|---|---|---|
| | Reviewer | Maintainer | Reviewer | Maintainer | Creator / Maintainer |
| Access | Statewide | | District | | |
| Creates jobs for others | ✓ | | ✓ | | |
| Creates jobs for self | ✓ | | ✓ | | ✓ |
| Review jobs completed by others | ✓ | | ✓ | | |
| Commit jobs completed by self | ✓ | | ✓ | | ✓ |
| Work an assigned job | ✓ | ✓ | ✓ | ✓ | ✓ |

***Table 1 GRID User Roles***

## 1.2 TPP Maintainer

The TPP Maintainer is a user assigned to a group or section in TPP that is tasked with performing statewide LRS and/or RAI-related maintenance activities. These individuals are assigned jobs to complete by a TPP Reviewer. Their work, once submitted, must be reviewed and approved or rejected by a TPP Reviewer before any of their changes are committed to the operational database and their job closed.

## 1.3 TPP Reviewer

The TPP Reviewer is a user/manager assigned to oversee the TPP Maintainers' work. They create and assign jobs to TPP Maintainers. They can also create and assign jobs to themselves and other TPP Reviewers. After a TPP Maintainer submits a completed job, the TPP Reviewer conducts his/her review and either approves or rejects the job. If approved, the job's maintenance work is then committed to the operational database and the job is automatically closed. If rejected, the job is sent back to the assigned TPP Maintainer with a comment from the TPP Reviewer.

## 1.4 Non-TPP Maintainer

The Non-TPP Maintainer is a user located in a TxDOT District that is assigned LRS and/or RAI - related maintenance activities in their district of responsibility. A Non-TPP Maintainer is very similar to a TPP Maintainer in that neither TPP nor Non-TPP Maintainers can create jobs. The differences between a TPP and Non-TPP Maintainer are that Non-TPP Maintainers are:

- Limited to work within their district.
- Able to edit certain assets, but not all (this is true of all types of Non-TPP users). See Appendix C for the list of assets and which roles can edit them.
- Assigned work only by Non-TPP Reviewers in the same district.

## 1.5 Non-TPP Reviewer

The Non-TPP Reviewer is a user/manager assigned to oversee maintenance work within their assigned district. Like the TPP Reviewers, they are responsible for creating jobs for Non-TPP Maintainers and reviewing work performed by Non-TPP Maintainers.

## 1.6 Non-TPP Creator/Maintainer

The Non-TPP Creator/Maintainer exists for use in districts where the Maintainer and Reviewer is the same person. This role allows you to create jobs for yourself and then work them, but you cannot create or review jobs for any other role.

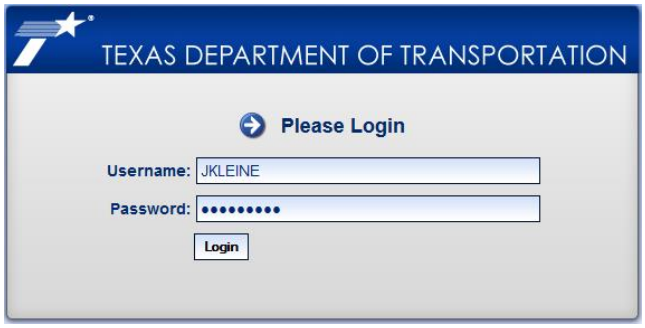
# Section 2. Accessing GRID

GRID training must be completed before access to the GRID production environment is granted. You can access GRID through an Internet browser as long as you are connected to the TxDOT domain. Because GRID is a web application, it does not impose significant system requirements on your local system. There are a few requirements that must be met, however, to launch and use GRID. Before logging into GRID, you must:

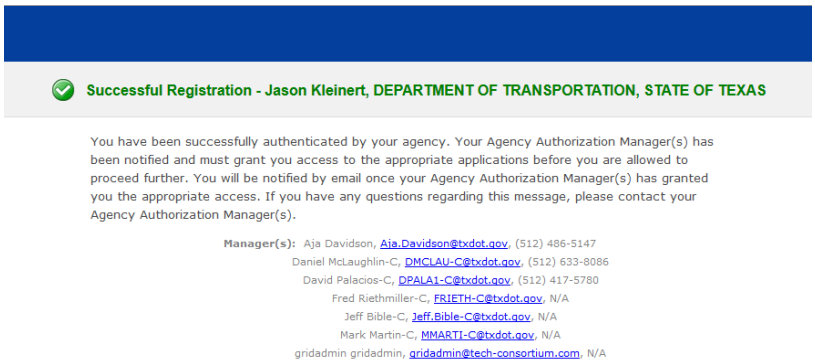
- Have an active TxDOT user account.
- Be connected to the TxDOT intranet.
- Have the following installed and configured on your computer:
    - Internet Explorer version 8.x or higher or Firefox version 5.x or higher
    - JavaScript enabled
    - Adobe Flash player version 10.x or higher
- Complete GRID training (TxDOT course number PLN216)

The GRID Launch page is available at the following URL: http://grid.dot.state.tx.us/launch/.

When you browse to GRID, you will see a login screen:




Enter your TxDOT domain credentials and click Login. If you are successfully authenticated, you will see a notification screen:



This screen tells you that you have successfully requested access to GRID. A GRID Administrator must then approve your access and assign you to a role. You will receive an email notice that your access has been approved. Then, when you browse to the URL the next time, after entering your login credentials, you will see the GRID Launch Page.

## 2.1 GRID Launch Page

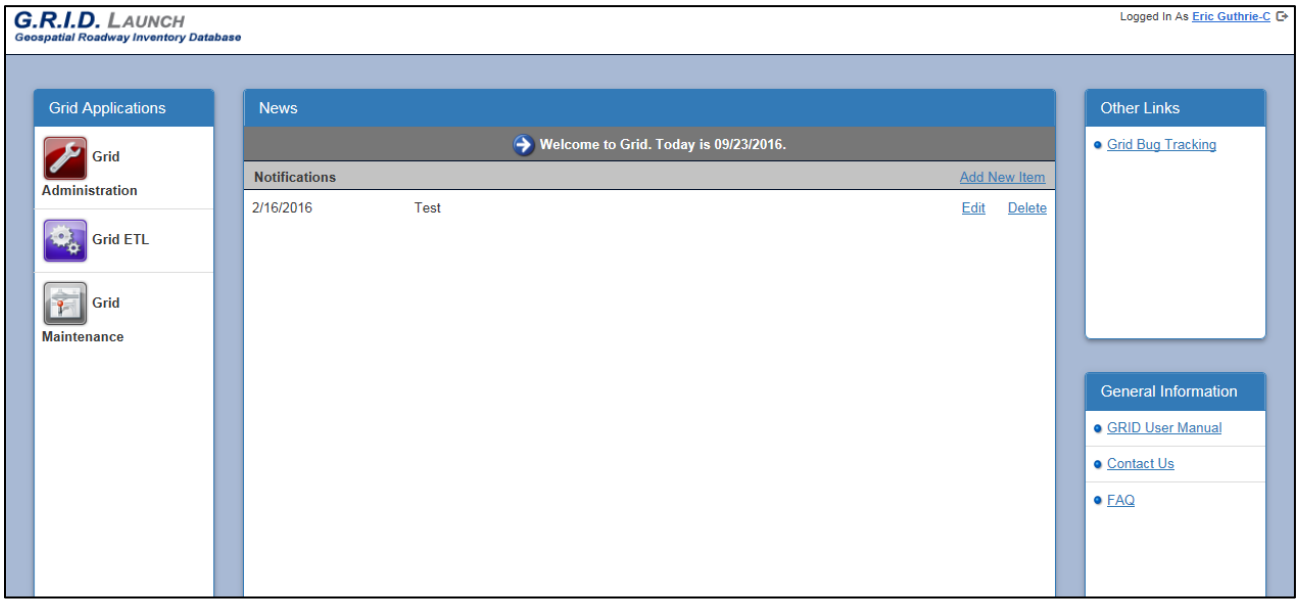



***Figure 1: GRID Launch Screen***

What you see when you enter through Launch depends on the role(s) assigned to you.

### 2.1.1 Grid Applications Tab

The GRID Applications tab allows you to access different GRID Applications based on your role(s). Most users will only see the GRID Maintenance application icon, though some users will also see the GRID Administrator and/or GRID ETL modules.

### 2.1.2 News Section

The News section is comprised of notifications from GRID Administrators. Notifications will be used to inform users of upcoming version releases and times the application will not be accessible.

### 2.1.3 Other Links

The Other Links tab provides a link to the **GRID Bug Tracking** website. If you click on the GRID Bug Tracking link, you will be taken to the Bugzilla application which allows you to track the

status of the existing bugs in GRID. You may have to be granted additional access to log in to Bugzilla. More information can be found in the Bugzilla manual at: https://cricket.dot.state.tx.us/docs/en/html/using.html.


***Figure 2: Bugzilla Application***

## 2.1.4 General Information Links

The General Information links will provide you additional information on the GRID application, such as the GRID User Manual and the GRID FAQ. It also contains a **Contact Us** link which will open an email to GRID@txdot.gov where you can get assistance with GRID from the Transportation Planning and Programming (TPP) Division. Additionally you can call them by phone (512-486-5080).

# Section 3. Using the GMA Interface

When you click on the GRID Maintenance button on the Launch Page, the GMA opens. In the upper right hand corner of the screen the user is identified. A Logout link is displayed in blue.


The GRID interface is separated into two panels. The left panel is the **Home** panel with two vertical tabs under the word **Home**. The **Maintenance Actions** tab is open by default. The minimized tab is the **Legend** tab which can be displayed by clicking on it.

The right panel displays the map. Upon login, the interstate highways and district boundaries feature prominently.

The following graphic identifies key features of the GRID interface as displayed after login.

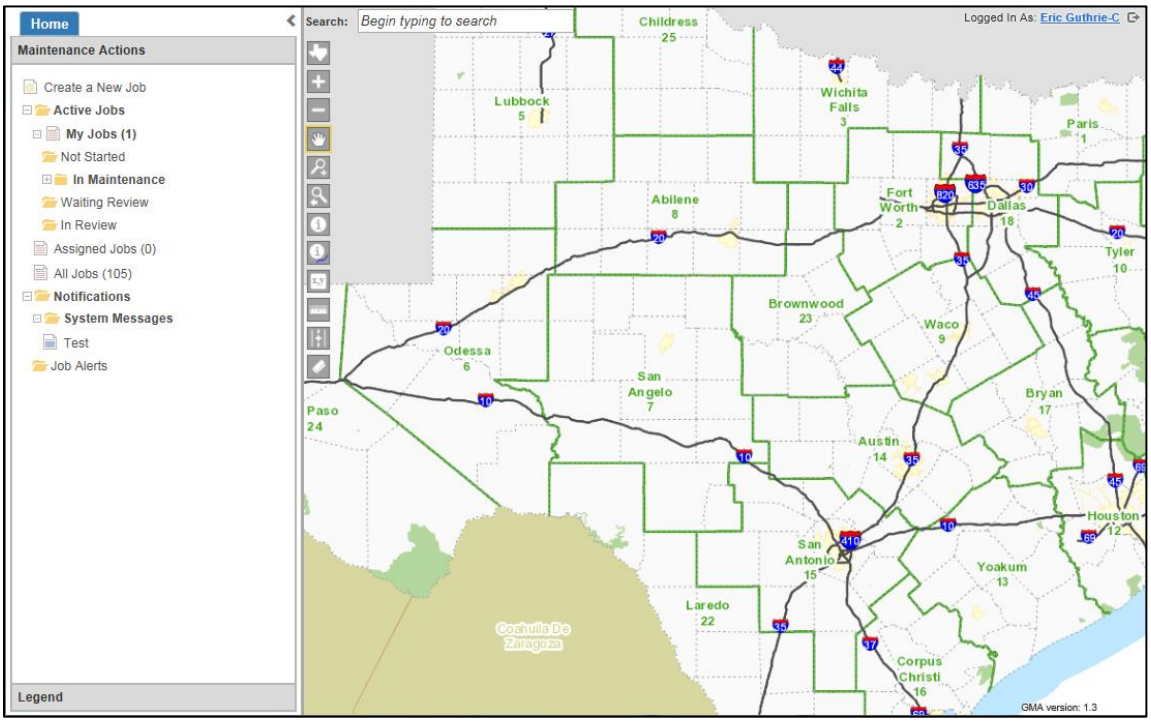



***Figure 3: GRID User Interface***

| GRID User Interface Features | |
|---|---|
| **Panels** | |
| 1 Home/Left Panel | 2 Map/Right Panel |
| **Tabs** | |
| 3 Maintenance Actions Tab | 4 Legend Tab |
| **Controls and Tools** | |
| 5 Close Home Panel | 6 Search Box |
| 7 Latitude / Longitude | 8 Tools |
| **Tools Defined** | |
|  Zoom to State |  Identify Feature |
|  Zoom In |  Identify Route/Roadbed |
|  Zoom Out |  Coordinate Readout |
|  Pan |  Measure Distance |
|  Zoom Box |  LRS Readout |
|  Zoom Previous |  Erase Graphics |

The icons and their related functions will be discussed further in the sections below.

## 3.1 Navigating the Home Panel

When GRID is opened, the **Home** panel is expanded by default.

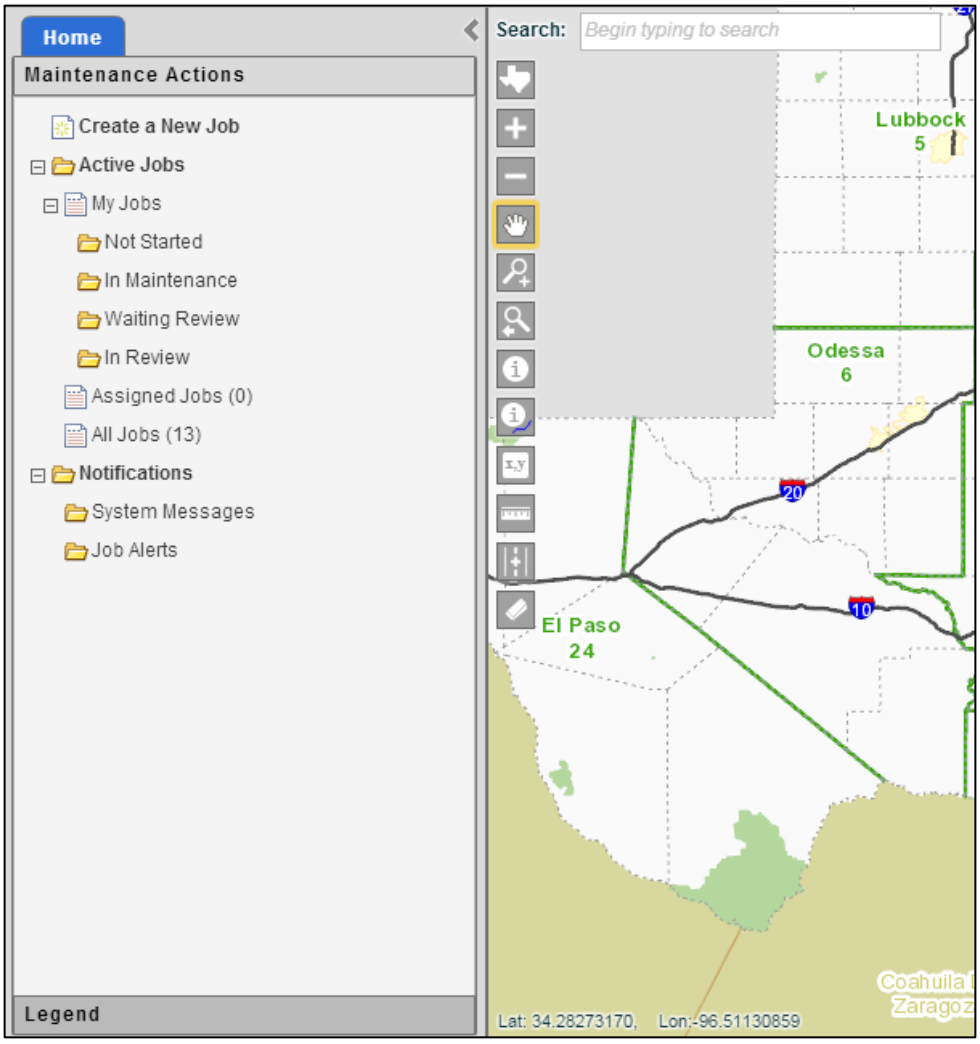



***Figure 4: GRID Home Panel (Expanded)***

The **Home** panel contains the **Maintenance Actions** and **Legend** tabs. At the top right corner of the **Home** panel is an arrow  . This is used to minimize the **Home** panel. If you move your cursor over the arrow it will turn yellow and a text box will appear that describes the function of the arrow. All icons in the GRID workspace produce similar text descriptions when you hover over them. If you click on the arrow, the panel closes. The map shifts left and a new icon is added to the top of the icon list.

**Home tool**: This tool opens the **Home** panel and only appears when the **Home** panel is collapsed.

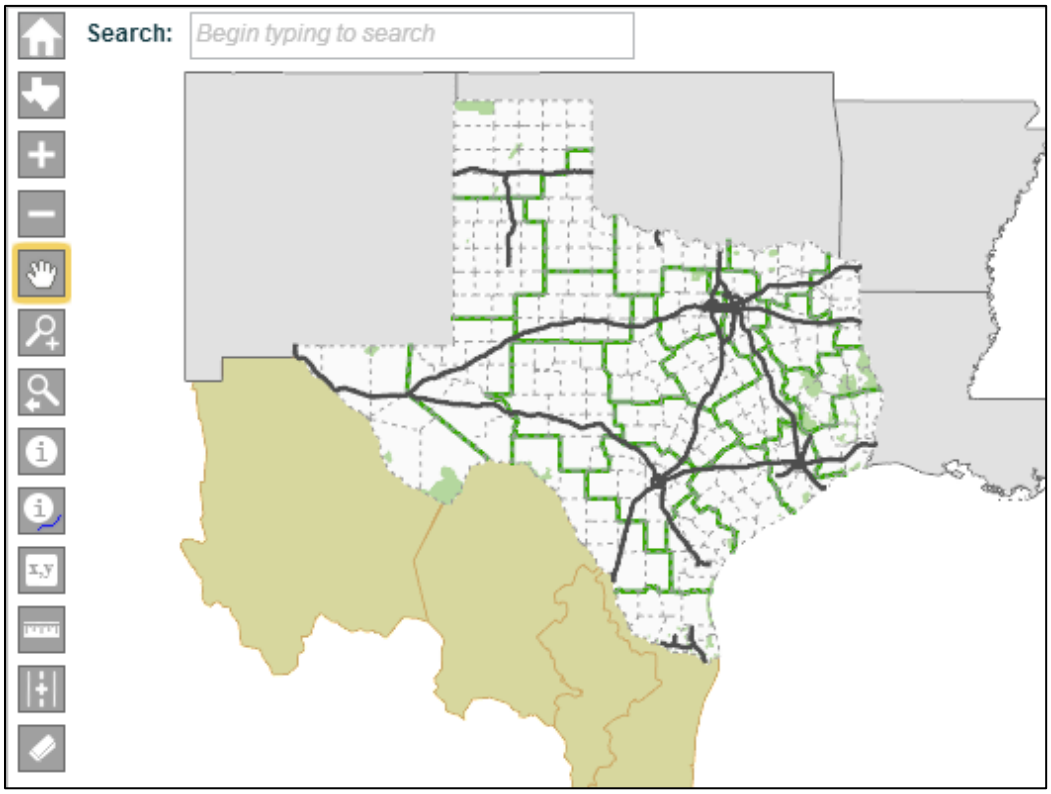



***Figure 5: GRID Home Panel (Collapsed)***

### 3.1.1 Maintenance Actions Tab

The **Maintenance Actions** tab contains the Create a New Job link and two top-level folders: **Active Jobs** and **Notifications**. The sub-folders within Active Jobs will vary based on your role. In the example image below, the user has folders for **Not Started**, **In Maintenance**, **Waiting Review** and **In Review**. These are all related to Jobs you have been assigned or are working on. You can also see all of **My Jobs**, **Assigned Jobs** (if you are a Reviewer) and **All Jobs**. These sections are discussed further in the Working with Jobs section of this User Guide.

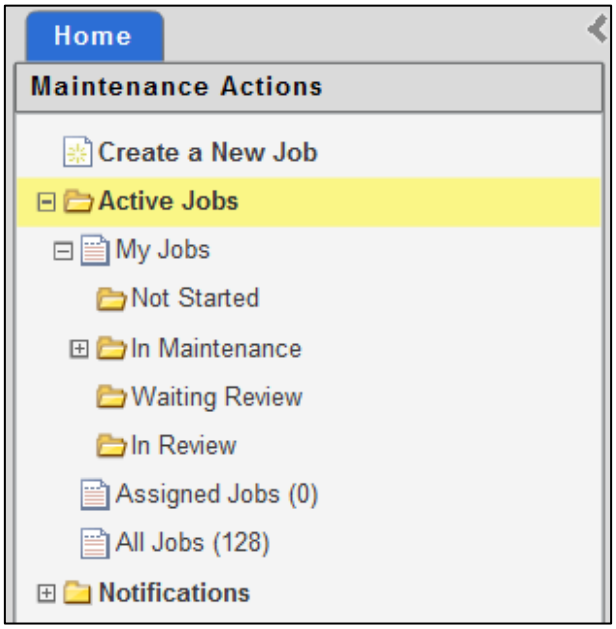



*Figure 6: Maintenance Actions Tab*

### 3.1.2 The Legend

If you click on the **Legend** tab in the **Home** panel, the GRID legend displays.

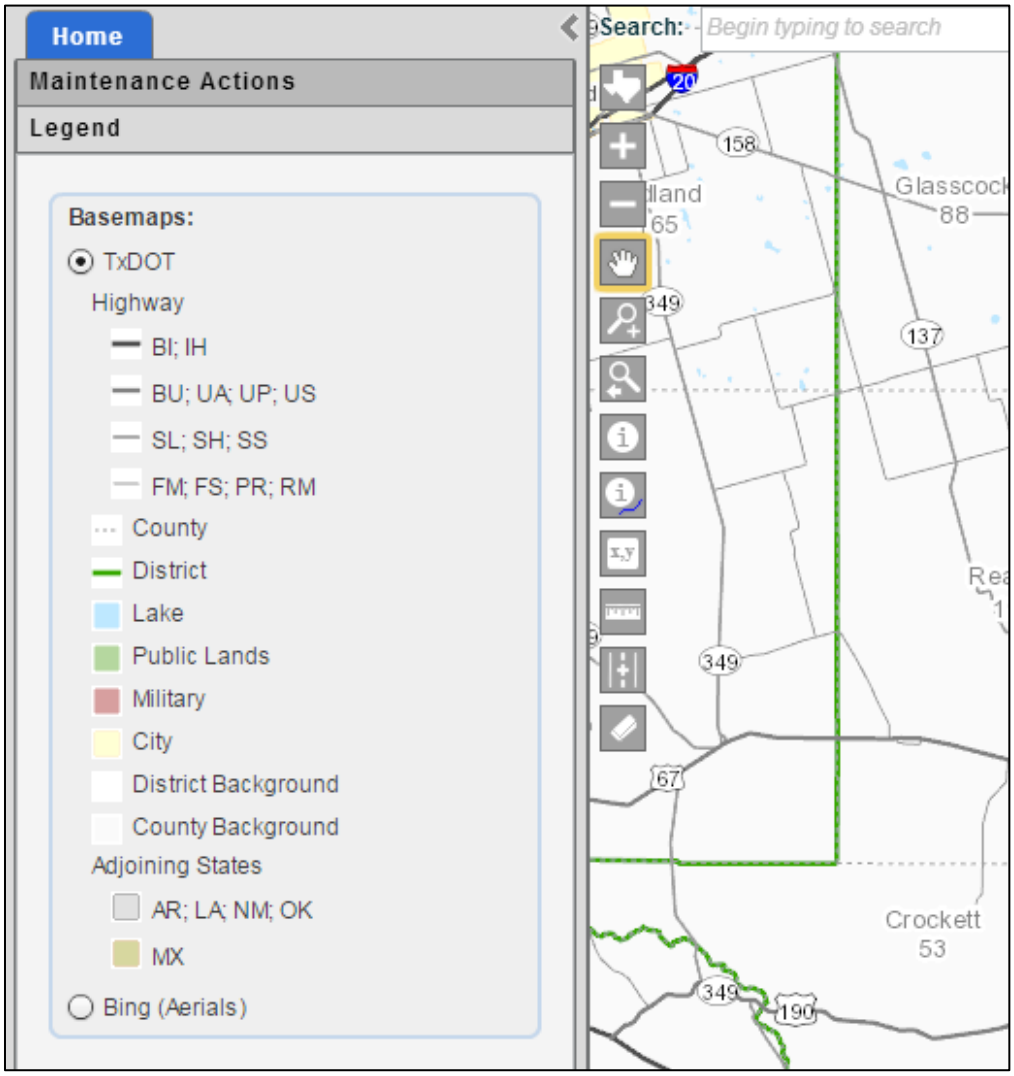



***Figure 7: GRID Legend***

The legend is populated by the features that are visible at the current map display scale. As you zoom in, the legend is populated with additional items more features and details appear in the map.

### 3.1.3 Bing Aerials View

At the bottom of the legend is the option for Bing (Aerials). This option replaces the points, lines, and polygons of the TxDOT basemap layers with a Bing satellite image.

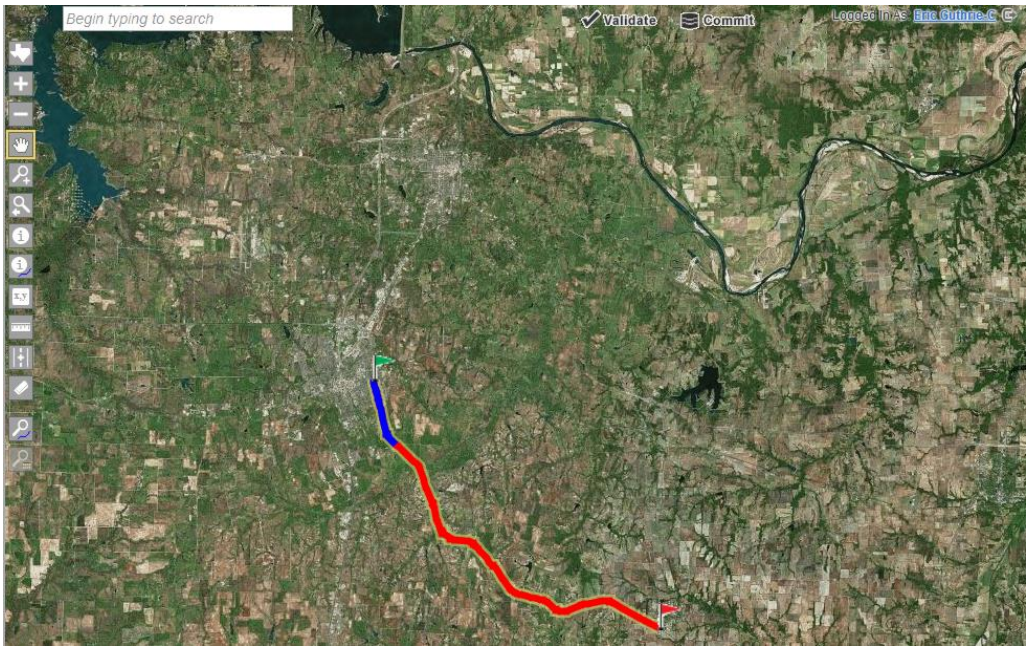



***Figure 8: Bing Aerial Satellite Image***

The Bing Aerial view overlays satellite imagery onto the map to display roads and major landmarks for easier identification and to help confirm real life objects. The aerial imagery, base map layers, and labels cannot be directly edited in GRID.

## 3.2 Using the Map Tools

The GRID map interface provides the tools that allow the user to manipulate the map display.

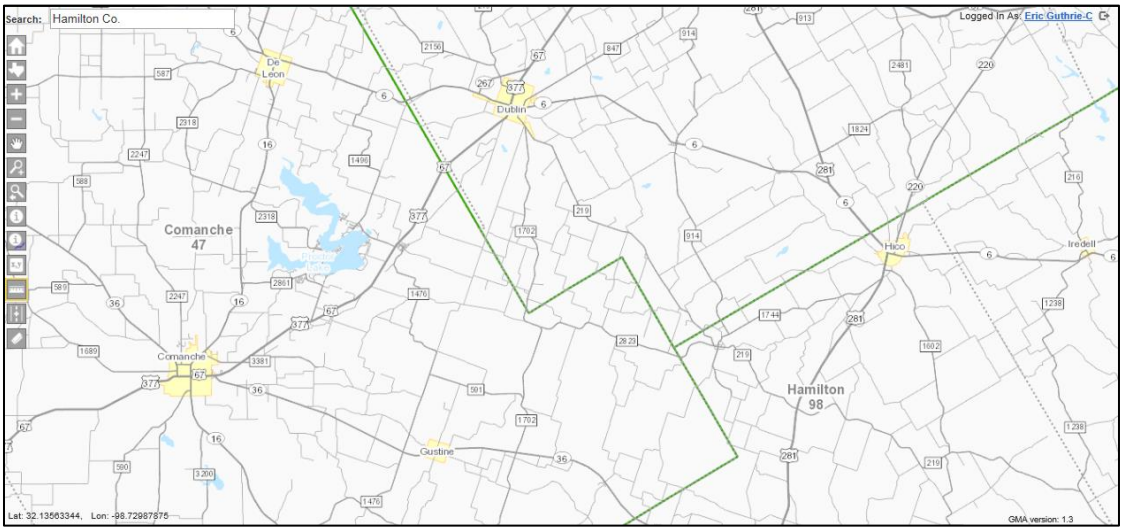



***Figure 9: GRID Map Interface***

**Search**

The Search field, located in the upper left corner of the map panel, is one of the most efficient ways to navigate to a specific location in GRID.


***Figure 10: GRID Search Field***

The search option has a few important characteristics:

- Not all map features are available within the search.
- You can search for cities, counties, control sections, parks, and routes.
- The search option will search for exact text only.
- The search option will list all features that begin with the same text as you are entering it into the search bar.
- Names will populate in a selection list when the third character is typed.
- Searching is not case sensitive.
- All routes have a two digit route prefix (listed in Appendix A). Plus:
    - On-system: 4 numeric digits (and sometimes a character suffix)
    - County roads: 5 numeric digits and a county name

- Functionally classified city streets: 6 numeric digits
- City streets: 7 numeric digits
- Federal roads: 4 numeric digits

| Route Type | Format Convention | Example |
|---|---|---|
| **State Designated (On-System)** | Route Prefix + Route Number (4 bytes) + Route Suffix when applicable | BU0067V |
| **County Roads** | 'CR' + Inventory Number (5 bytes) + County Name | CR00100 Zavala |
| **Functionally Classified City Streets** | 'FC' + Inventory Number (6 bytes) + County Name and/or DFO limits | FC250003 Fannin Co. [2.342] |
| **Local City Streets** | 'CS' + Inventory Number (7 bytes) + County Name and/or DFO Limits | CS1200006 Cass Co. |
| **Federal Roads** | 'FD' + Inventory Number (6 bytes) | FD700005 |
| **Non-State Designated Toll Routes** | 'NA' + Inventory Number (1 byte) | NA8 |

Type the first three characters of the search criteria for a list of possible locations to appear as a dropdown list in the search box.

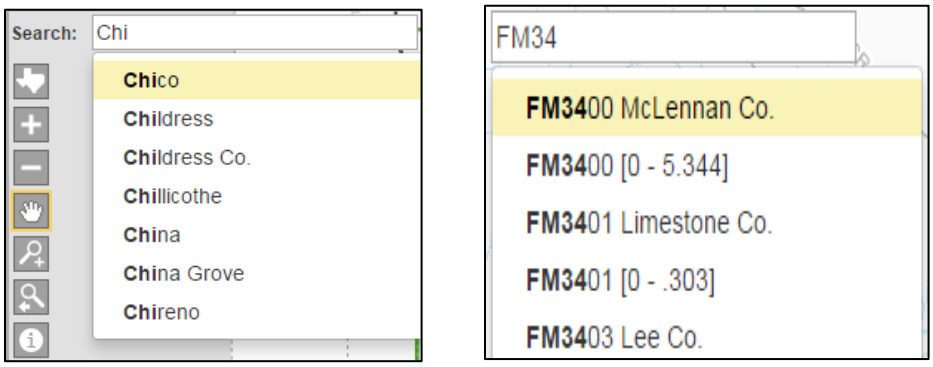



***Figure 11: Searching in GRID***

## Map Tools

The following map tools are displayed along the left edge of the Map Panel.

**Pan tool**: Allows the map to be scrolled by clicking and holding on the map space and moving the mouse. The Pan tool is different from other tools in that it can be used anytime, even if the icon is not the active icon. The Pan tool is the default active tool if no other tools are currently selected.

**Zoom to State tool**: Restores the map to the state level, allowing you to see the State borders.

**Zoom In tool:** Zooms in on the center of the map space. You can also zoom in by pushing the scroll button between the mouse buttons away from you, or by double-clicking on the map. The map will zoom in centered on the cursor.

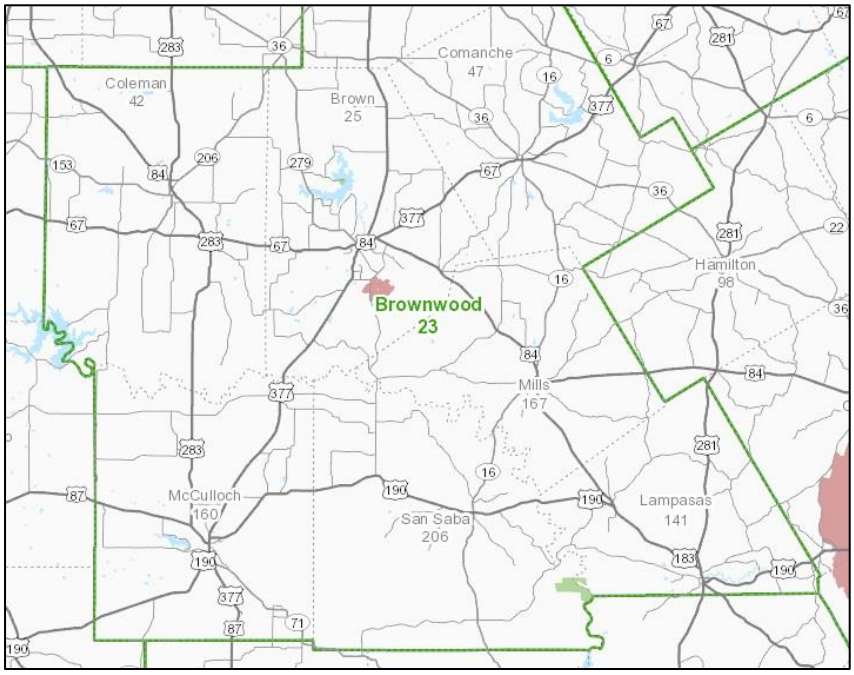



***Figure 12: Zooming into the GRID Map***

As you zoom in, the level of detail increases. Some map elements, such as State and County roads will only become visible at specific zoom levels.

**Zoom Out tool**: Zooms out from the center of the map. You can also zoom out by pushing the scroll button between the mouse buttons toward you.

**Zoom Box tool**: Allows you to select a rectangular area of the map to zoom into.

**Zoom Previous tool**: Zooms to previous map extent.

***WARNING:*** *Do not click the browser back button while working in GRID. Clicking the back button will log the user out of the application.*

**Identify Features tool:** Identifies all base map features and roadways that exist at the point where you click. Select the tool, and then click a point on the map. A green hash mark is displayed on the point clicked and the Identify Results window displays the features at that point. Each record in the Identify Results window can be double-clicked for additional detailed information. Click Close to dismiss the window.

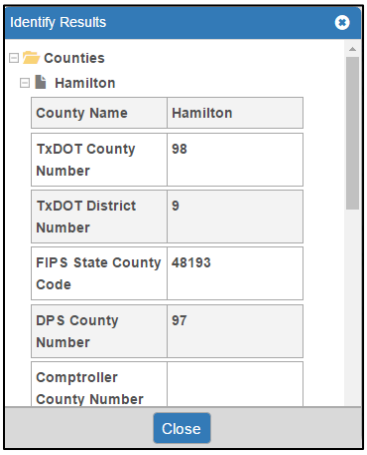



***Figure 13: Identify Results***

**Identify Route/Roadbed tool**: Identifies the route and roadbed nearest to the selected point. Select the tool and then click a point on the map. The system will snap the point to the nearest route. A blue hash mark will appear at the snapped location. The Roadbed Details window displays the Route, Roadbed, and Length of the identified segment. Click Close to dismiss the window.

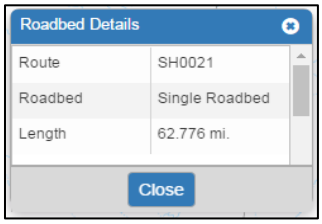



***Figure 14: Roadbed Details***

**Coordinate Readout tool**: Provides the latitude and longitude coordinate values for the point selected.

**Measure Distance tool:** Allows you to measure the distance between two points, or to measure cumulative distance between multiple successive points. The distance displays as a status at the bottom of the map in similar fashion to the latitude and longitude measurements. 

If you move your cursor over the measurement a window will appear to offer display options for the units of measure.


***Figure 15: Units of Measurement Display Options***

**LRS Readout tool:** Lists the route, DFO, latitude, longitude, control section, milepoint, reference marker, and offset for a selected point on a route. Activate the tool and then click a location in the map panel. The system will snap to the nearest roadway and place a red hash mark at the snapped location.

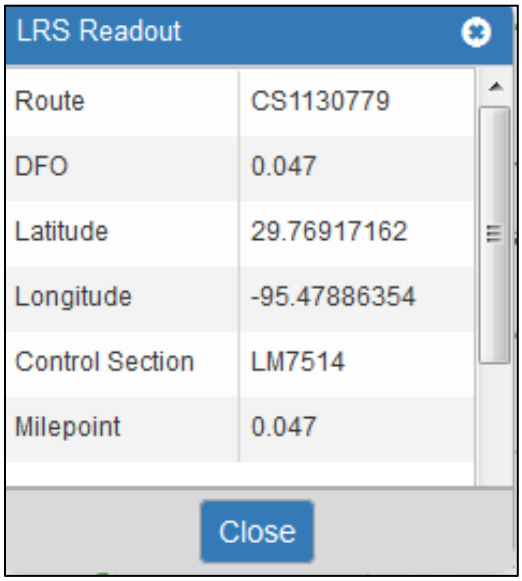



***Figure 16: LRS Readout***

**Erase tool:** Clears all hash marks and other temporary graphics created by the map tools. GRID will then default back to the Pan tool.

# Section 4. GRID Concepts

## 4.1 Roadbeds

A Roadbed is defined as a driveable roadway segment separated from other roadway segments by any physical barrier including fences, concrete blocks, or other non-driveable surface. The following graphic identifies the roadbed classifications. This is important to understand because GRID maintains separate data entries for each roadbed of a route. For example, an Interstate Highway might have a northbound roadbed and a southbound roadbed, with a median between, and separation between the main lanes and frontage roads. For this section of the highway, there will be four potential data updates to make – one each for the X, L, R, and A roadbeds.

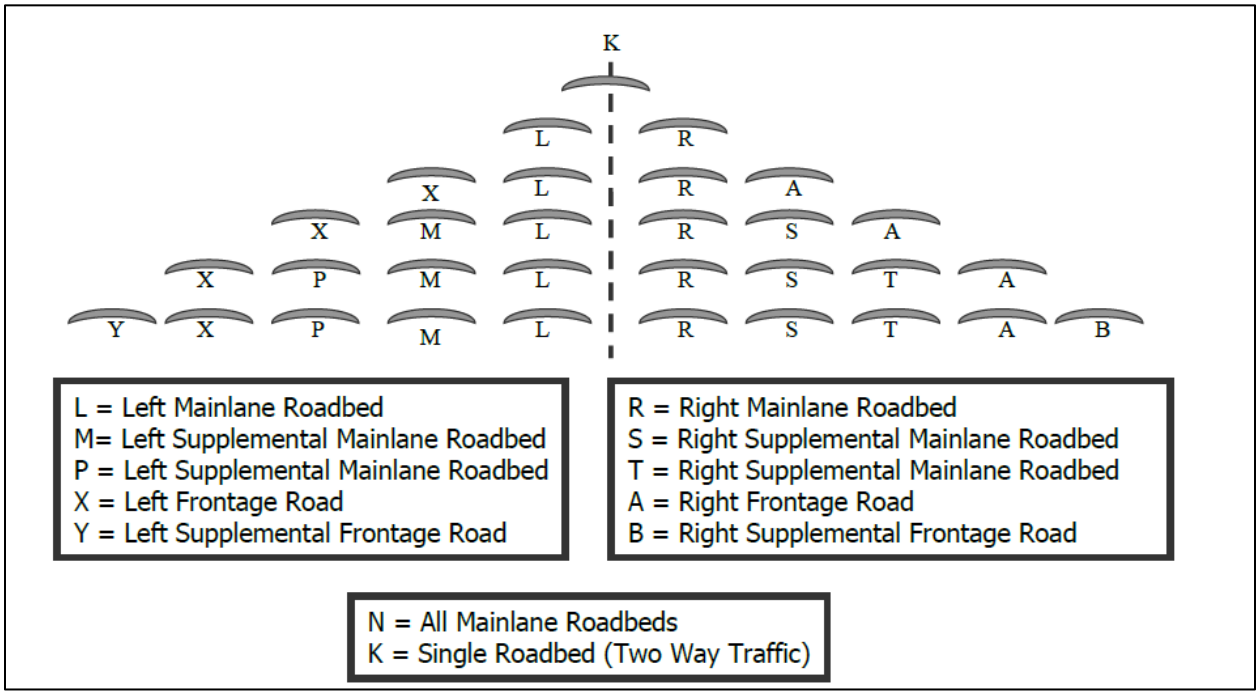



***Figure 17: Roadbed Classifications***

## 4.2 Linear Referencing Methods

Linear referencing is a method of spatially locating features along a measured line from a defined starting point. A good resource for general information about linear referencing can be found here:

http://webhelp.esri.com/arcgisdesktop/9.2/index.cfm?TopicName=An_overview_of_linear_referencing.

GRID is designed so that if a segment of a route is changed, only assets on the changed segment need to be updated. There are four types of linear referencing methods used in GRID, which are listed below:

- Route Coordinate (latitude and longitude)
- Distance from Origin (DFO)
- Texas Reference Marker (TRM) + offset
- Control Section Milepoint (CSM)

# Section 5. Job Workflow

As seen in the GRID workflows diagram below, jobs are created, assigned, worked on, validated, submitted, and then reviewed. A job locks a route or portion of a route for a single user to maintain roadway asset data.

The following diagram illustrates a high-level workflow which applies to most jobs in GRID.

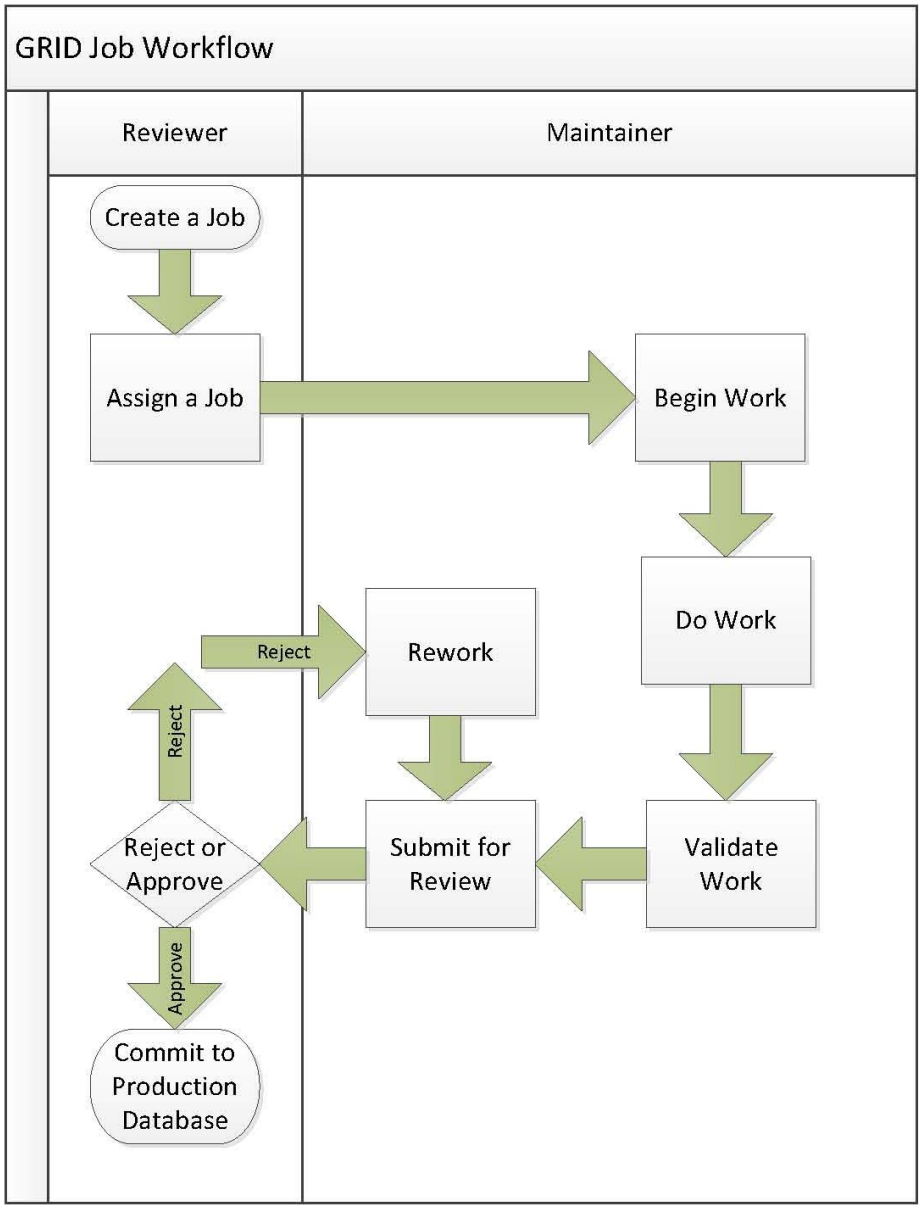



*Figure 18: GRID Job Workflow*

# Section 6. Working with Jobs

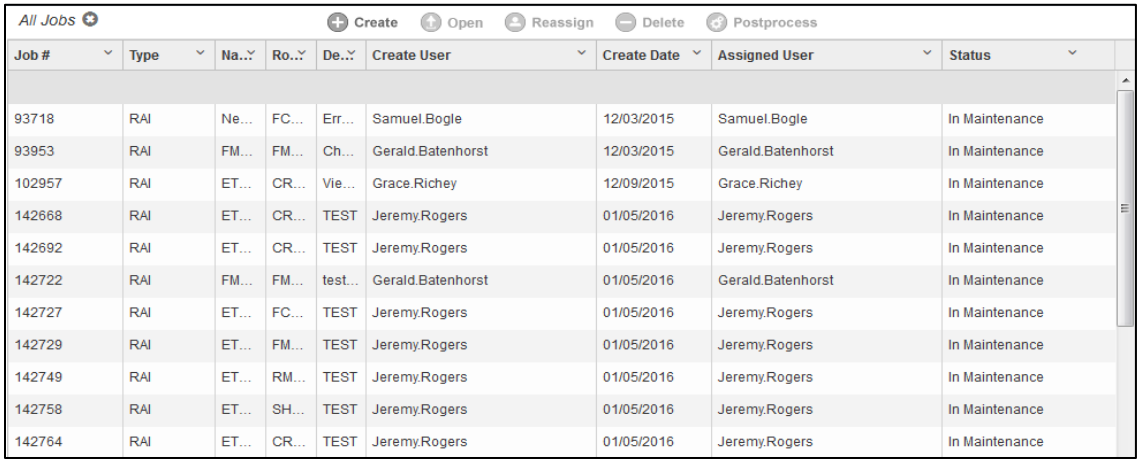
## 6.1 Finding Jobs in the Home Panel

There are different types of job lists that can be opened from GRID's **Home** panel. These will be different based on your role. The lists are: 1) My Jobs, 2) Assigned Jobs and 3) All Jobs. The All Jobs list provides a list of all jobs in the GRID system, and is not filtered.

**NOTE:** *Assigned Jobs are only visible if you are a Reviewer.*

## 6.2 Using the All Jobs Table

There may be times you need to see all the jobs that exist within GRID. If you click on the **All Jobs** button, the **Map** panel will be replaced by the **All Jobs** table. Each row of the table represents a single job. If a job has a status of 'Not Started', the route associated with the job can be worked on in another job. Once work on a job has begun it will be moved to the **In Maintenance** status and the route will become locked. You can close the **All Jobs** table by clicking on the "x" next to the **All Jobs** text at the upper left.




| Job # | Type | Na.. | Ro.. | De.. | Create User | Create Date | Assigned User | Status |
|---|---|---|---|---|---|---|---|---|
| 93718 | RAI | Ne... | FC... | Err... | Samuel.Bogle | 12/03/2015 | Samuel.Bogle | In Maintenance |
| 93953 | RAI | FM... | FM... | Ch... | Gerald.Batenhorst | 12/03/2015 | Gerald.Batenhorst | In Maintenance |
| 102957 | RAI | ET... | CR... | Vie... | Grace.Richey | 12/09/2015 | Grace.Richey | In Maintenance |
| 142668 | RAI | ET... | CR... | TEST | Jeremy.Rogers | 01/05/2016 | Jeremy.Rogers | In Maintenance |
| 142692 | RAI | ET... | CR... | TEST | Jeremy.Rogers | 01/05/2016 | Jeremy.Rogers | In Maintenance |
| 142722 | RAI | FM... | FM... | test... | Gerald.Batenhorst | 01/05/2016 | Gerald.Batenhorst | In Maintenance |
| 142727 | RAI | ET... | FC... | TEST | Jeremy.Rogers | 01/05/2016 | Jeremy.Rogers | In Maintenance |
| 142729 | RAI | ET... | FM... | TEST | Jeremy.Rogers | 01/05/2016 | Jeremy.Rogers | In Maintenance |
| 142749 | RAI | ET... | RM... | TEST | Jeremy.Rogers | 01/05/2016 | Jeremy.Rogers | In Maintenance |
| 142758 | RAI | ET... | SH... | TEST | Jeremy.Rogers | 01/05/2016 | Jeremy.Rogers | In Maintenance |
| 142764 | RAI | ET... | CR... | TEST | Jeremy.Rogers | 01/05/2016 | Jeremy.Rogers | In Maintenance |

***Figure 19: All Jobs Table***

## 6.2.1 Sorting Jobs by a Single Column

You can sort jobs in ascending or descending order by any column. If you move your cursor over a field heading, an up arrow appears within it. Click on the arrow to sort all jobs by this column, in ascending order. Click it again to sort in descending order. By default, jobs are sorted by their Create Date with the newest job at the bottom of the list.


***Figure 20: Route Column Header***

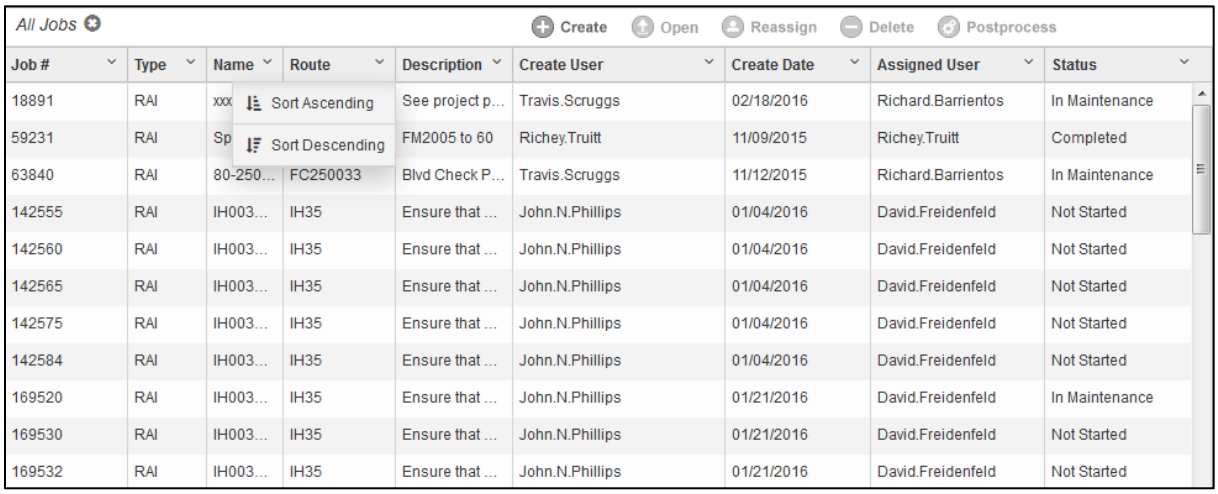



***Figure 21: Sorting the All Jobs Table***

## 6.2.2 Sorting by Multiple Columns

As you move your cursor over the name of the column, the number 1 that appears indicates it is the primary method of sorting. To sort the list even further hover your mouse over the name of a different column and note that the column header will display the number 2. By clicking to apply that change you will now be sorting by number 1, then number 2. There is no constraint on the number of fields you can sort by.

## 6.2.3 Understanding Job Status

If the Status of a job is **In Maintenance**, the **Assigned User** has it locked. If the Status of the job is **In Review,** the **Create User** has it locked. If the Status is **Not Started**, no work on the job has begun. When the Status changes to **Completed**, the route is unlocked and a new job can be worked on that route.

### 6.2.4 Viewing Locked Jobs

There may be times you need to view a job that you are not currently assigned, and this can be done by opening the job in View Only mode. To do so, follow the steps below:

1. Click on the row of a job in the All Jobs table that isn't yours.
2. At the top center of the screen, click the **Open** icon. 

. Alternatively, you can double-click on the record.
3. When clicked, the job will open and two messages will appear.

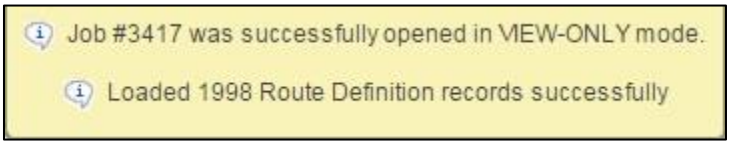



***Figure 22: Opening a Job in VIEW-ONLY Mode***

4. The job was opened in the VIEW-ONLY mode. You can look at someone else's work and perhaps collaborate on a solution. Keep in mind work can only be completed and submitted by the Assigned User.

### 6.2.5 Legend Panels in a Job

While working on a job, the GRID Legend is expanded to include **Asset Layers** and **Job Graphics** sections. The legend control allows you to change base maps and toggle on/off asset layers in the map display. When working with LRS or RAI data, the legend control highlights the current active asset under the Asset Group. You have the option to view other asset layers in the map. The image below shows the legend control displaying the active asset.

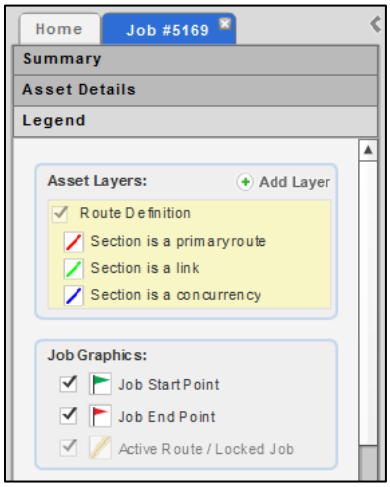



***Figure 23: Job Legend***

To add another asset layer to the map you must click the **Add Layer** link in the legend.

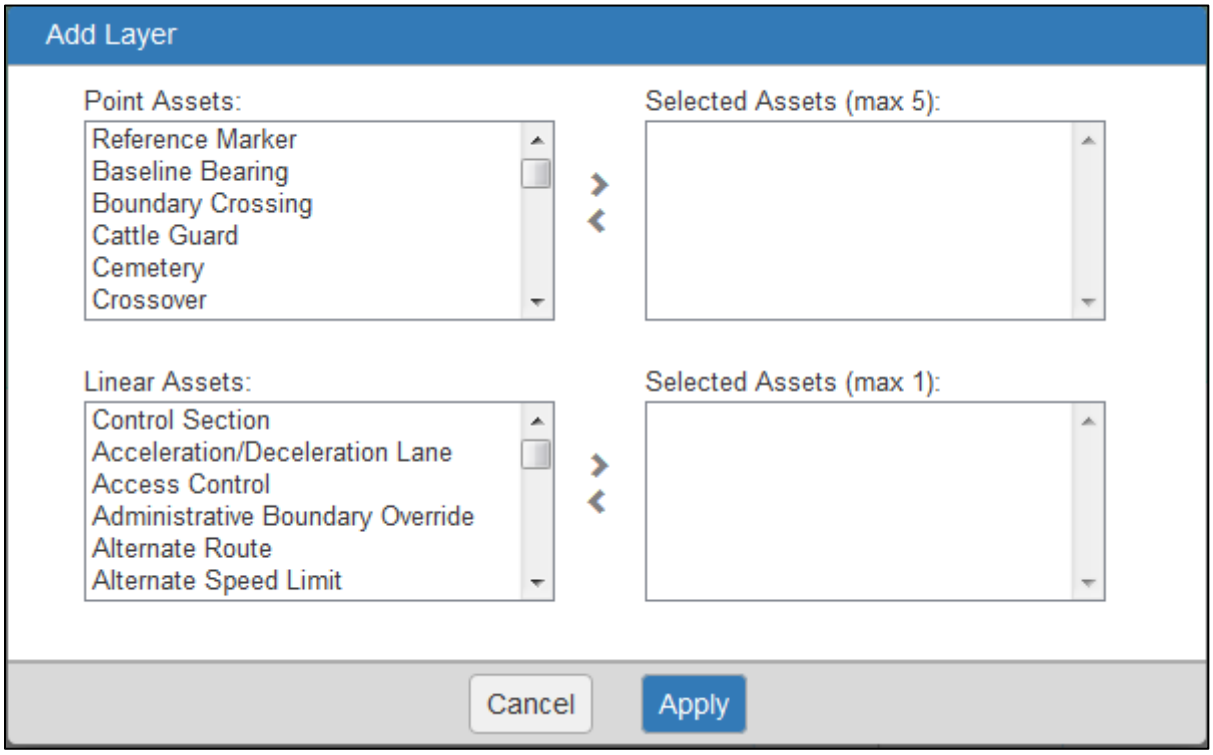



***Figure 24: Add Layer Dialog Screen***

This control allows you to select up to 5 points and/or 1 linear asset to add as a view-only map layers. To aid in viewing multiple layers, GRID will display linear assets below and point assets above the current 'active asset.'

Too add a new asset, click on the available Point or Linear Asset you wish to add to the map and click the right arrow to move it into the Selected Assets section. Then click **Add, or double-click on the Asset.** You can also use the CTRL or Shift keys to select more than one asset at a time.

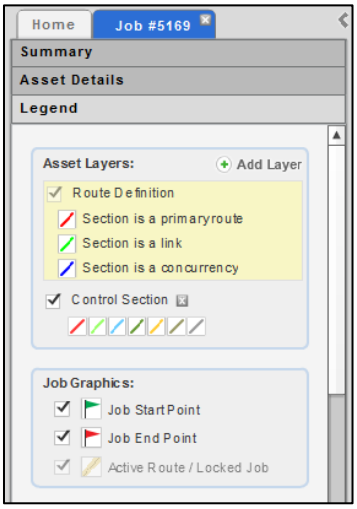



***Figure 25: Add Layer Screen***

As you can see in the example above, the Control Section layer has now been added.

Once an asset layer is added to the map/legend, you can remove each added asset layer by clicking the delete button (x) next to the layer's name in the legend. This action does not physically remove any data from the database. It only removes the layer from the map.

## 6.2.6 Tool Icons in a Job

Some Tool icons will only appear while working on a job. These include:

**Zoom to Selected Route tool:** Zooms to the selected Route extent on the Map.

**Zoom to Selected Records tool:** Zooms to the selected Record on the map.

**Set Asset Begin Point tool:** Sets the Asset Begin Point.

**Set Asset End Point tool:** Sets the Asset End Point.

**Add New Point Feature tool:** Allows you to add a new Point Feature.

## 6.3 Creating an LRS Job

To begin creating a job, follow the steps below.

*Note that each browser will display the required fields slightly differently.*

1. At the top of the Maintenance Actions tab is a line to **Create a New Job**.

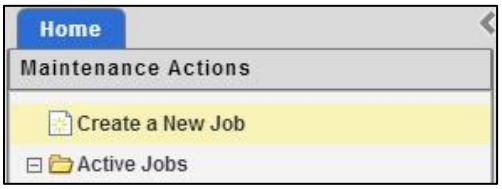



***Figure 26: Create a New Job Icon***

2. When you click on **Create a New Job**, the Maintenance Actions window expands to include the fields involved in job creation. Also, three new tools display on the map: Select Route, Select Job Start, and Select Job End.

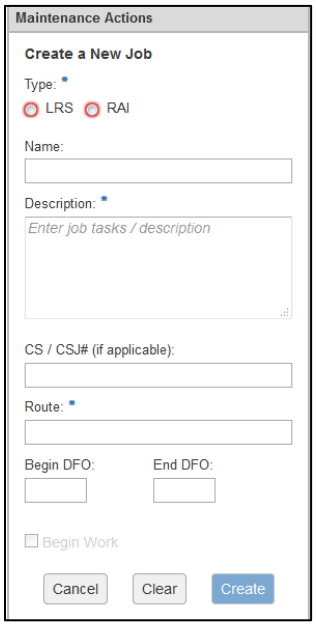



***Figure 27: Create a New Job Form***

3. The Cancel button is now active. At any time you have the option to cancel the creation of the new job and return to the Jobs folder tree.

4. The first option is a choice of Type. This is a required selection, as indicated by the asterisk next to the field label. You can perform maintenance on the Linear Referencing System (LRS) or the Roadway Asset Inventory (RAI).

5. Click on the button next to LRS. Three things change immediately.

- At the bottom of the screen the middle button is activated. At any time you can click on Clear to start over.
- A new required field is added. Each job must have a person assigned to the job.
- Red italic text appears warning you that your job is not saved.

6. The first empty field is the job name. This field allows you to enter a name for the job. There is a 50 character limit on the job name.

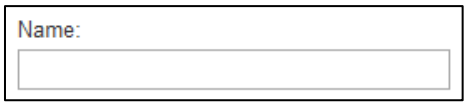



***Figure 28: Job Name Field***

7. Now enter a description. This field is required.
8. Now you may enter the control section or control section job number if you have that information. This may help in linking to construction plans.
9. There are two ways to select the Route on which the job work will be done.
    a. The first option is to begin typing the route name you are searching for in the Route field, beginning with the route prefix. Once you enter three characters, multiple routes and/or route segments will populate the selection list. Select the Route or route segment you are searching for to continue.

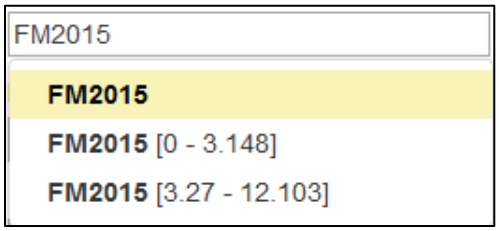



***Figure 29: Searching for a Route***


*Figure 30: Selecting a Route*

The selected route will highlight and flags will be added to the begin and end points. These flags match the flags in the icons for the Select Job Start and Select Job End tools:

 **Select Job Start** tool.

 **Select Job End** tool.

b. The second option for selecting a route is the **Select Route** tool.

 **Select Route** tool.

Navigate to the area in which you want to create the job. Click on the Select Route tool, and then click on the route on which you want to create the job. The selection list populates with all route segments in the vicinity of your clicked point. Select the correct route from the list.

10. Either way the Route is selected, the system will automatically populate the Begin DFO and End DFO fields based on the minimum and maximum values for the selected segment.

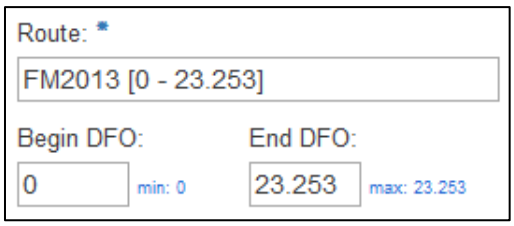



*Figure 31: Begin and End DFO*

11. You may want to adjust the extents of the job by changing the Begin DFO and End DFO values. There are two ways to do this. The first method is to type in new **Begin DFO** and **End DFO** values. The typed in values must be within the minimum and maximum defined by the selected route. The minimum and maximum values are displayed to the right of the **Begin DFO** and **End DFO** boxes.

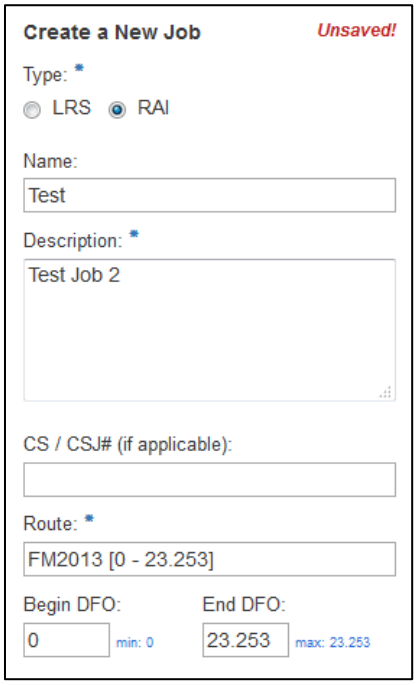



***Figure 32: Creating an LRS Job***

12. The second method is to use the **Select Job Start** and **Select Job End** tools. Click on the **Select Job Start** icon, and then click the desired starting point along the selected route. The **Begin DFO** field in the Create A New Job form populates with the new DFO. Next, click the **Select Job End** icon, and then click the desired ending point along the selected route. The End DFO field in the Create a New Job form populates with the new DFO.
13. Next, you must assign the job. In the **Assigned To** field there is a drop down arrow. Click it and assign the job.
14. If you are a reviewer, and have assigned the job to yourself, you have the option to **Begin Work**. If you wish to begin work immediately after the job is created, check the **Begin Work** box.
15. Click the **Create** button to create the job.
16. An alert appears at the top center of the map space.

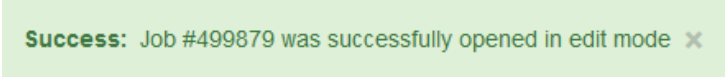



***Figure 33: Job Successfully Created Alert***

17. This job was successfully created. Many different alerts will appear in this format. Some confirm successful operations and others indicate unsuccessful operations. You need to read them to tell the difference because they all have the same background. You should read them in real time as they happen because they will disappear from the screen after ten seconds. Some notifications will also appear in the Notifications list on the Maintenance Actions home screen.
18. Click **Cancel** to return to the full list of Maintenance Actions.

## 6.3.1 LRS Assets

The three types of LRS assets editable in the application include Route Definitions, Control Sections, and Reference Markers.

### 6.3.1.1 Route Definitions and Concurrent Routes

There are two types of route definitions: primary route definitions and concurrencies. Primary route definitions describe the route that is being worked in the job. A concurrency occurs when two or more highways are designated over the same physical roadway. There are two types of concurrencies: concurrencies and links. A concurrency is officially designated, a link is not.

For concurrent route segments, one route is the primary route and any others occupying the same roadway segment are secondary routes. The primary route is usually the highest Highway System route. For example, in the figure below, SH0071 and FM0275 are concurrent with US0290 along the west-to-east road. In this section, US0290 is the primary route and the others are secondary routes. Then, SH0071 continues eastward and US0290 and FM0275 follow the IH0035 roadbeds. In this section, IH0035 is the primary and the others are secondary.

***Note:*** *Primary route definitions cannot be edited by any users. Concurrencies can only be edited by TPP users.*


***Figure 34: Concurrent Routes***

### 6.3.1.2 Control Sections

The Control Sections tab in the asset panel contains all control sections within the extents of your job. This is equivalent to all control sections that are partially or completely located between the start and end lock points of the job. A control section is displayed in the map and the asset panel in the figure below.

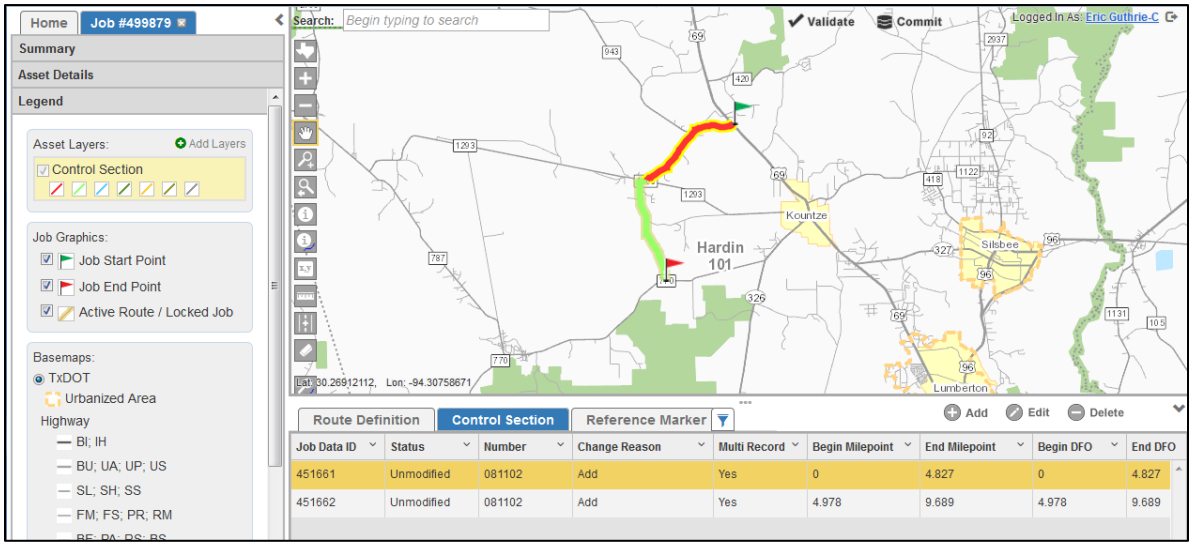



***Figure 35: Control Section Asset***

There are two ways to select a record, in the table or by selecting the record in the map. When a record is selected in the map, the Asset Details form for that record opens in the Home panel. The map does not zoom to the record. If a record is selected in the table, the map zooms to the record but the record does not open in the home panel. The user either has to double click the record or select the Edit button. From the Asset Details form, you can perform edits to attribute data (i.e. Control Section Number), or optionally delete the control section record, which would remove the feature from the list and from the map. The screen below captures an add operation for a new control section at the beginning of the route segment.

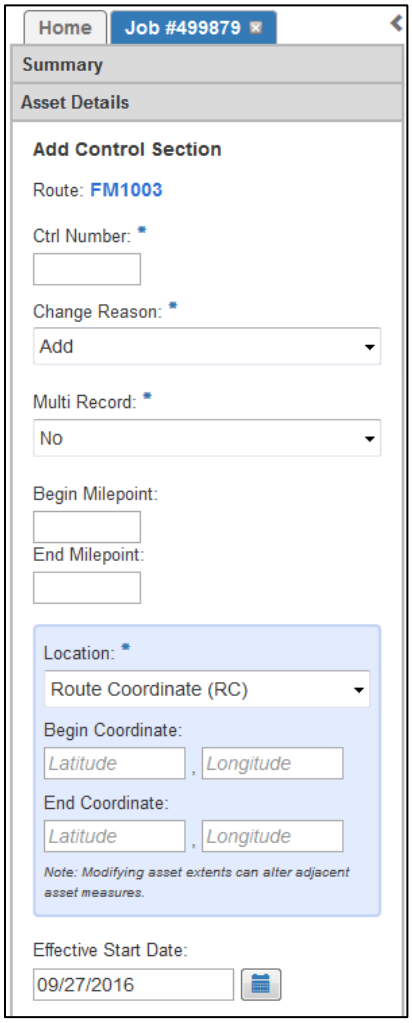



***Figure 36: Control Section Add Screen***

### 6.3.1.3 Reference Markers

The Reference Marker tab in the asset panel lists all reference markers located within the job extents. The image below depicts reference marker data displayed in the map and asset panels.

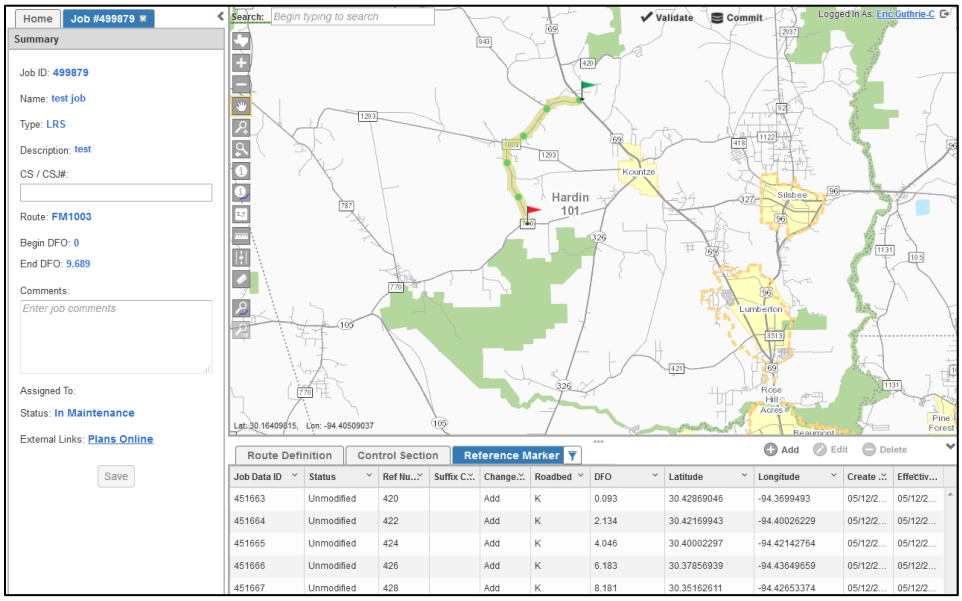



***Figure 37: Reference Marker Screen***

Like with other assets, you can select existing reference markers from the map or from the asset table. The creation of new Reference Markers within the application is conducted through an Add button that allows for the placement of the new marker by a selected map point or an entered measurement (DFO, latitude/longitude, or Control Section Milepoint, or offset from another Reference Marker).

### 6.3.2 LRS Edit Permissions

GRID maintains separate business/data rules specific to each type of LRS asset. The table below details the default editing privileges for LRS assets by user type.

| | User Type | | | | |
|---|---|---|---|---|---|
| **LRS Event Data** | **TPP Maintainer** | **TPP Reviewer** | **Non TPP Maintainer** | **Non TPP Reviewer** | **Non TPP Creator/Maintainer** |
| Route Definitions (Concurrencies) | Yes | Yes | No | No | No |
| Control Sections | Yes | Yes | No | No | No |
| Reference Markers | Yes | Yes | Yes | Yes | Yes |

# 6.4 Assets

## 6.4.1 Adding, Editing and Deleting Assets

### 6.4.1.1 Adding an Asset

Adding a new asset is performed by clicking the **Add** button located in the right corner of the asset panel. This allows you to add a new asset for the tab you are on and initiates a blank Asset Detail form. You may locate a new asset by using the Set Asset Point tools or entering locations (e.g. DFO, latitude/longitude). The figure below provides an example of adding a new **Alternate Route** asset.

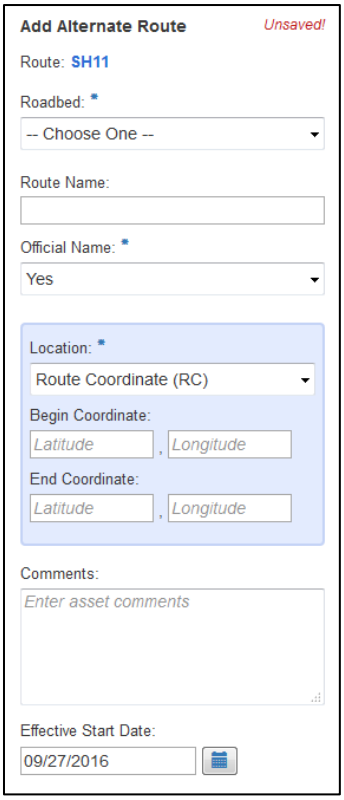



***Figure 38: Adding an Alternate Route Asset***

Once you have entered the information required for the new Asset, click the **Save** button.

### 6.4.1.2 Editing an Asset

To open a record from the asset table, you can either double click the record or highlight the record and select the Edit button. This action will automatically trigger the selected asset to be loaded in an Asset Details form. From this form, you can modify asset attributes and

location. By adjusting an asset's length or location using one of the four location methods or the Set Asset Point tools, a user can trim, extend or move an asset. Depending on each asset's properties and existence of adjacent assets, modifications to neighboring asset extents may automatically occur once you save.

While a textual warning exists in the Edit form informing you of the potential for adjacent extent changes, the application will not present any other dialog/alert during processing unless an adjacent asset could potentially be deleted by the operation. An example of this would be when an asset's End DFO value is modified past the end of another asset.

#### 6.4.1.3 Deleting an Asset

This action is performed by selecting the asset either in the map or in the asset table, then clicking the Delete button. Like all maintenance operations, the delete operation occurs within the context of the job and nothing is committed to the operational database until the job is approved and committed. The following screen shows the delete confirmation dialog.

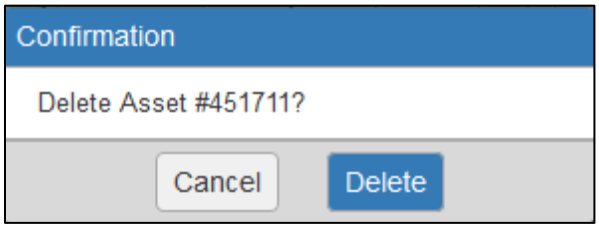



***Figure 39: Delete Asset Confirmation Box***

## 6.4.2 Splitting, Joining and Copying Assets

Aside from Adding, Editing and Deleting Assets, you can also Split, Join and Copy them.


***Figure 40: Split, Join and Copy Asset Tools***

### 6.4.2.1 Splitting an Asset

Select the record you wish to split. Click on the **Split** tool icon, the **Split Asset** window will be displayed.

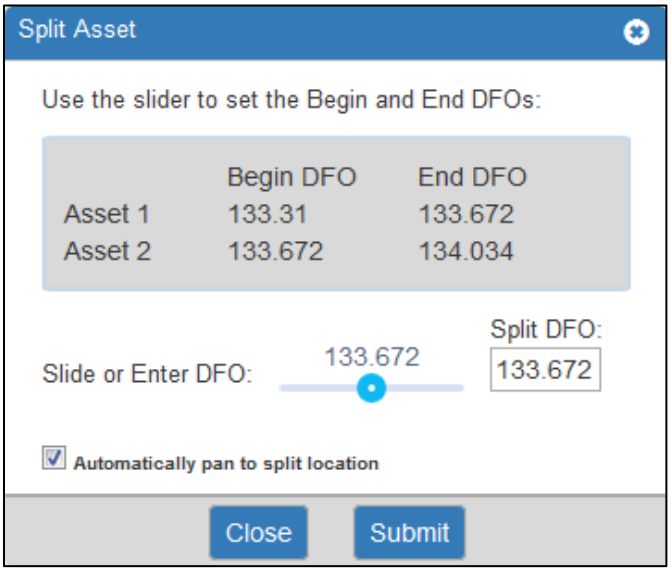



***Figure 41: Split Asset Window***

This window enables you to split an asset into two pieces. The default value is the midpoint of the asset record. You can move the slider to change the point of the split or enter the value into the **Split DFO** field.

There is instantaneous validation of the values you can enter. You won't have to save or validate your work with this tool. If the value is valid the **Split** tool becomes active and your work is saved when you click on the **Split** tool. The following alert displays:

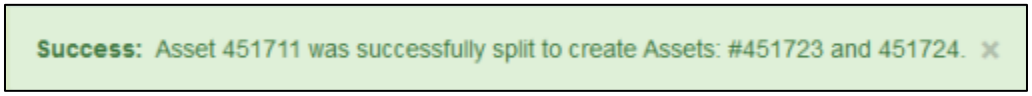



***Figure 42: Asset Successfully Split***

The Asset# that was formally assigned to the segment will no longer show in the asset table. It has been converted to two new assets with two numbers. These two assets can now be given values for maximum speed limit that vary from one another.

The Status of the new assets will be **Added**.

| Job Data ID | Status | Speed Limit (mph) |
|---|---|---|
| 451723 | Added | 55 |
| 451724 | Added | 55 |

***Figure 43: Asset Successfully Added***

### 6.4.2.2 Joining Assets

To Join Assets, you must first select two rows of adjacent Assets. The Roadbed for both records must match and the End DFO of the first record must match the Begin DFO of the second record.

| | | | | | |
|---|---|---|---|---|---|
| 451722 | Unmodified | 55 | R | 133.31 | 134.036 |
| 451723 | Added | 55 | K | 133.31 | 133.672 |

Click on the first of the two rows. Hold down the Ctrl key and click the second row. Both rows highlight and the **Join** tool becomes active. 

Click on the **Join** tool to open the **Join Assets** window.

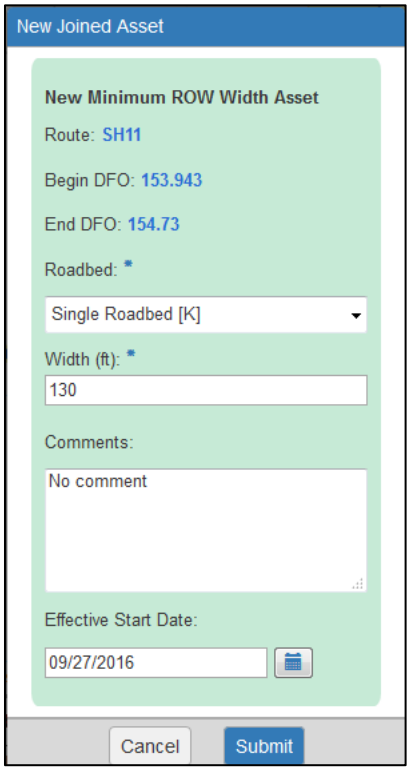



***Figure 44: Joining Assets***

The assets are listed on the left side of the window. The **New Asset** form on the right side has fields that can be altered. By default, the first joined record populates the **New Asset** form. The **Join** tool is active which means the two assets can be combined.

### 6.4.2.3 Copying Assets

Assets can also be copied. By Selecting an Asset and clicking the **Copy** tool, all of the Assets details can be copied to a new Asset. The process will be similar to creating a new Asset, but will copy all of the existing Asset details. If an asset has ten fields it will populate all those fields the same way. Then, you only have to change the location or one or two relevant fields. If you add a new asset you have to fill all the fields from scratch.

## 6.5 Creating an RAI Job

Central to the maintenance workflow is the concept of a job. To begin creating a job, follow the steps below.

1. At the top of the Maintenance Actions tab is a line to **Create a New Job**.


***Figure 45: Create a New Job Icon***

2. When you click on **Create a New Job**, the Maintenance Actions window expands to include the fields involved in job creation. Also, three new tools display on the map: Select Route, Select Job Start, and Select Job End.

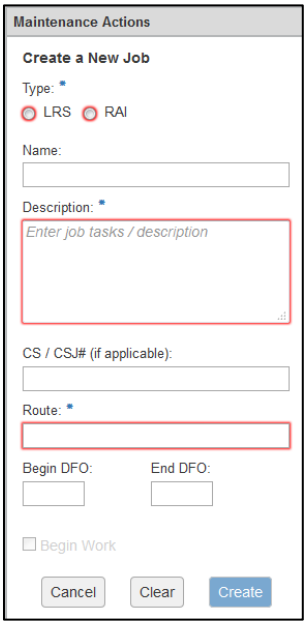



***Figure 46: Create a New Job Form***

3. The Cancel button is now active. At any time you have the option to cancel the creation of the new job and return to the Jobs folder tree.
4. The first option is a choice of Type. This is a required selection, as indicated by the asterisk next to the field label. You can perform maintenance on the Linear Referencing System (LRS) or the Roadway Asset Inventory (RAI).
5. Click RAI (Roadway Asset Inventory).

6. Enter Name, Description, CS/CSJ#, Route, Begin DFO, and End DFO as described in 6.3 for LRS jobs.

***NOTE:*** *One small difference is present when RAI is selected as the job type. TPP users have the option to check a box for ABO Only Job. ABO stands for Administrative Boundary Override. ABO jobs fall under the umbrella of RAI jobs because they are a similar type of asset. However, they function differently.*

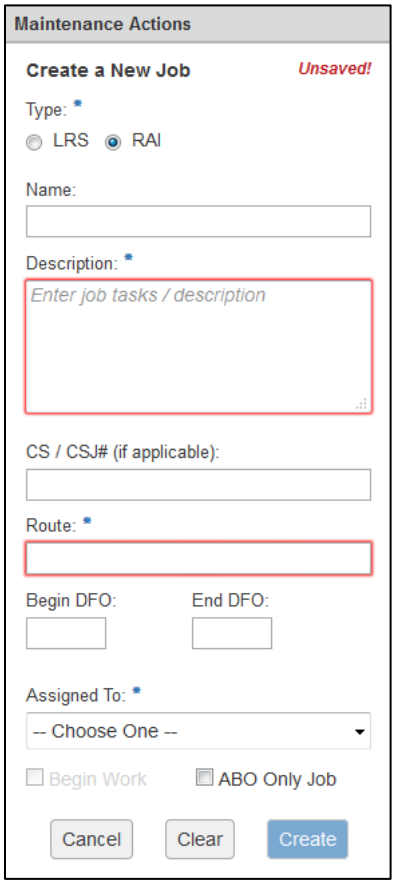



***Figure 47: Creating an RAI Job***

### 6.5.1 RAI Assets

There are over 100 distinct RAI assets in GRID. All are viewable by every user, but some are only editable by TPP personnel. A complete table listing whether the Asset is a Point or Line and detailing the default editing privileges for RAI assets by user type can be found in Appendix C: RAI Assets.

### 6.5.2 Data Groups

The Data Group control located in the top left of the Asset Panel provides you the ability to quickly view specific sets of RAI data. These asset groups are pre-defined and are based on common maintenance workflows.

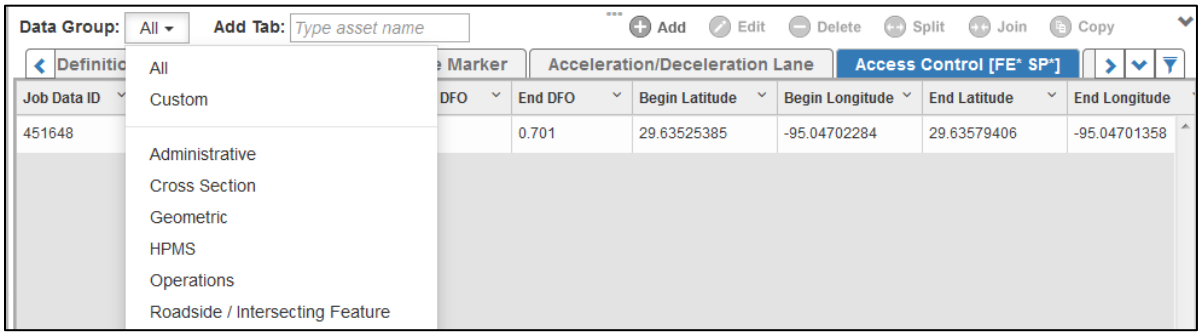



***Figure 48: Selecting a Data Group***

#### 6.5.2.1 HPMS Assets

To assist in conducting HPMS related edits, GRID provides an HPMS Sample data group. This group includes the HPMS Sample tab and all other HPMS Sample related data outlined in the HPMS Field Manual. For more information, you can refer to the-HPMS Field Manual at: http://www.fhwa.dot.gov/policyinformation/hpms/fieldmanual/.

The screen below depicts the HPMS Sample data group.

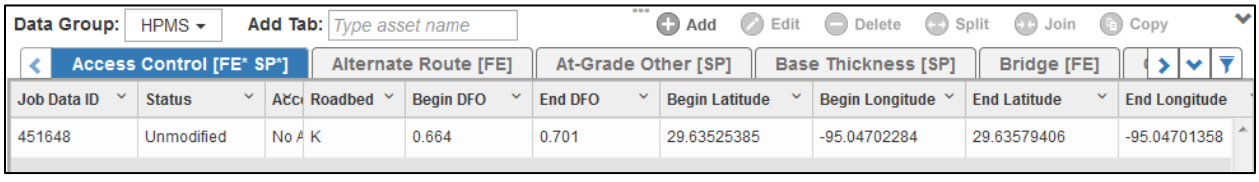



***Figure 49: HPMS Sample Data Group***

### 6.5.3 Adding Data Tab Screens

Within a Data Group, the **Add Tab** control allows users to search for, and add, other RAI asset tabs that are not currently visible in the asset table. The figure below depicts the process of finding and adding the Base Thickness tab to the Asset Panel.

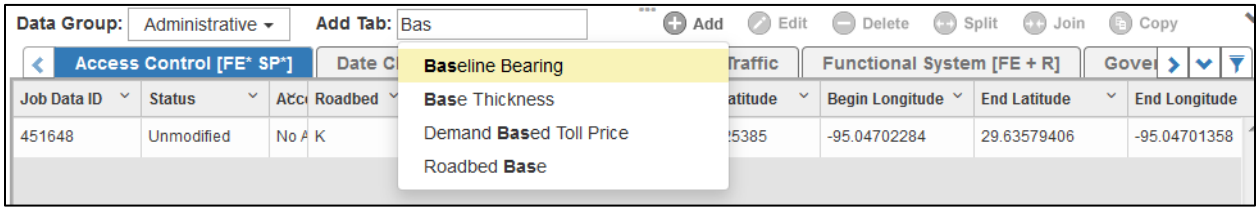



***Figure 50: Adding an Asset Tab***

Adding a new tab into the interface automatically activates the added tab and refreshes the map with the activated assets. This process of activating the asset also occurs when a non-active tab is selected in the interface. Activating an asset also updates the legend.

### 6.5.1 ABO Jobs

This type of job is a special type of RAI job. When working on an ABO job all other assets are view-only. Only ABO assets can be modified in an ABO job. An ABO job focuses specifically on a boundary. For instance, a segment of a route may cross a boundary between two Districts. The decision may be made that the entire segment is the jurisdiction of one of those Districts, even though it exists in two. For that example and other cases an Administrative Boundary Override is assigned. Data exports and validation rules use the underlying basemap layers to assign geography. ABOs supersede or override both of these functions. For example, if there is a cross-check validation rule that includes a check for whether or not the asset is in a UZA, a UZA ABO will be taken into account when the rule runs.

## 6.6 Assigning Jobs

When a user is first assigned a job, no route or assets are locked. This operation occurs during the initialization or **Begin Work** process. The route and the associated assets do not become locked until the Maintainer begins work on the job. Jobs can be assigned based on roles. For example, TPP can assign to TPP, and Non-TPP can assign to Non-TPP in own district. Reviewers can assign to both reviewers and maintainers and themselves.

***Note:*** *Simply assigning a job does not lock the route. Work must begin for the route to be locked.*

## 6.7 Validating Jobs

GRID includes over 500 data validation/business rules that help ensure data accuracy and integrity. There are two types of validation rules:

- **Simple**: Simple rules have a binary correct/incorrect state. For example, the Maximum Speed Limit must be a whole number that is a multiple of 5.
- **Cross-check**: Cross-check rules verify an asset against one or more other assets. For example, the Maximum Speed Limit must be > Minimum Speed Limit.

It is necessary to validate a job prior to submitting the job for review. This operation can be performed at any time from any maintenance screen.

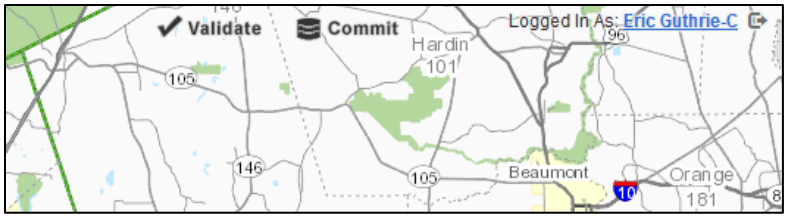



***Figure 51: Validate Button***

By clicking the Validate button in the upper-right of the map panel, all data in all tabs where a record was edited will be checked for errors. In addition, any data that is related through a cross-check validation rule will be checked. For example, if a user edits a Maximum Speed Limit Record, it will trigger the validation rule "Maximum Speed Limit must be > Minimum Speed Limit." So, all Minimum Speed Limit records will now be checked for any rule violations (not just the cross-check rule). All validation errors are returned back to your screen in The **Validation Errors** table that displays detailed error information for each identified asset.

Validation Errors — Clear All

| Rule ID | Job Data ID | Asset Type | Property Name | Severity | Message |
|---|---|---|---|---|---|
| 1.1 | 73872 | RailroadCrossing | | ERROR | Railroad Dot Number may not be null. |
| 2224.1 | 73872 | RailroadCrossing | | ERROR | Railroad DOT Number required for all Railroad Crossing type Intersecting Feature events. |

***Figure 52: Validation Errors Table***

There are two types of notifications that can be returned in the Validation Errors table, Warnings and Errors. A Warning does not prevent you from committing the job, but the user will have to click the Override button. An Error prevents the job from being submitted for review until the error is resolved. If any segment of roadway in the current job is open to traffic, cross check rule violations are always shown as errors and the job cannot be committed until the errors are resolved.

If there are no errors, you will receive a notification that the Job was successfully validated.

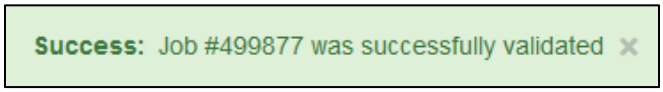



***Figure 53: Job Successfully Validated Notification***

For most users, the validation step represents their final task prior to submitting their work for review. The existing Validation Errors can be found in Appendix B: Error Messages.

## 6.8 Submitting Jobs

Once you are satisfied that you have completed all work within your assigned job, you can choose to submit your work for approval.

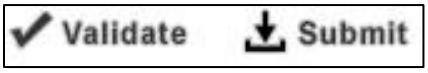



***Figure 54: Submit Button***

When the job is submitted for review it is reassigned to the reviewer, and they receive a Notification. The Maintainer receives an alert at the top of the screen similar to the Validation message described in Figure 51. For reviewers, and for the Non-TPP Creator/Maintainer role, the application provides a Commit button in the main interface to commit the job directly to the operational database. In this workflow, you are bypassing the formal submit and review process, and are allowed to review, validate and commit your work directly to the operational database.

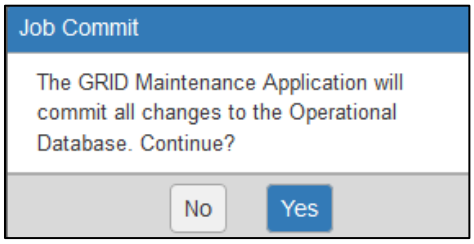



***Figure 55: Job Commit box***

**Note:** *There are some exceptions where a job can be submitted with validation warnings. This is due to a few known routes/assets that will always violate the validation rules. These exceptions are few and well known and are overridden by the reviewer prior to the job completion processes.*

The job is validated again upon submission. If there are any unresolved errors, they will be returned. Also, if there is an underlying issue with job submission not related to validation rules, an error message will be returned at the top of the map panel.

## 6.9 Reviewing Jobs

When notified by the GRID Maintenance Application, a reviewer can open a submitted job in order to evaluate the work performed by the maintainer. The Reviewer who assigned the job will be the Reviewer to review the work unless the review is reassigned in the All Jobs Table. Reviewers can see all of the jobs they have waiting for review in the Waiting Review folder under Maintenance Actions.


***Figure 56: Jobs Waiting Review***

Once a submitted job has been opened, you can begin reviewing and editing work performed by the Maintainer. The Review screen provides a new section in the upper-left portion of the interface to assist the Reviewer. The **Edits** area is a quick view of all the asset changes (by asset type) that were made in the job. This includes all adds, deletes and edits. These changes are also identified by an icon that assists in determining the edit action.


***Figure 57: Reviewer Edits Panel***

As you can see in the image above, there is also an option to Expand or Collapse  the folders in the edits area. These tools allow you to see the individual Assets that were changed in the job by the Maintainer.

As you select items from the **Edits** area, the map will pan/zoom to display the item in the map and in the asset table.

If the change was an edit, the application will display the appropriate Asset Details form to show the original and changed values. At any point in the review, you can make edits to values or

perform other maintenance actions because the review screen is actually an enhanced maintenance screen.

Once the review is complete, you can either reject or approve the job. If allowed by role, the application will display additional administrative controls at the top of the interface that allow for job deletion and reassignment.

If you choose to reject the job, the application will display the Reject Job form. This form requires the user to add comments that will be included in a rejection notification to the assigned maintainer.

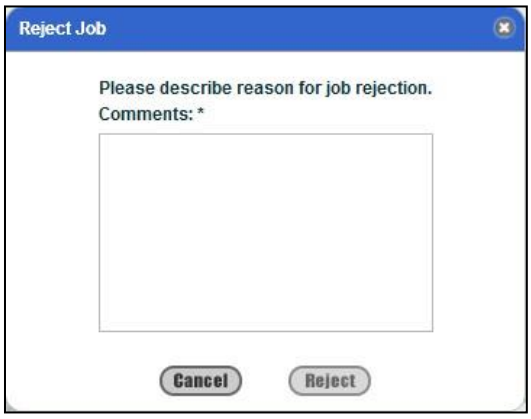



***Figure 58: Rejecting Jobs***

**NOTE:** *GRID will automatically add these rejection comments to the job summary information.*

If you choose to approve the job, the application verifies the action to ensure your intent. The submission process involves the validation of edits and the submission of all edits to the operational database. If successful, both the maintainer and reviewer are notified of the job completion and the job status changes to Completed.

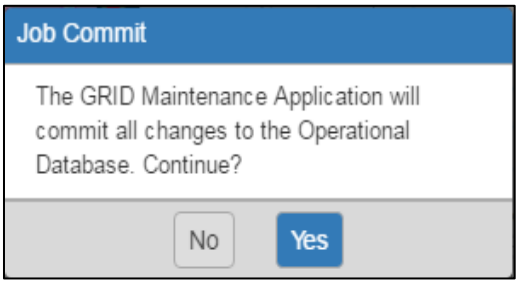



***Figure 59: Approving Jobs***

# Section 7. Job Notifications

There are many system notifications within GRID. All notifications conducted through the application are based on job and system-level events. These events are conveyed to you through pop-up notifications within the application interface.

One of the most common examples is the **Route is Locked** Warning.


***Figure 60: Route is Locked Warning***

Occasionally, when creating a job, you will receive a warning stating that the route is currently locked because another user is actively working on it. Multiple jobs can be created for the same route, however only one job may be worked on at a time. Once a job becomes active, the route is locked until the job has been completed, reviewed and committed to the operational database. Locking a route when there is an active job protects against conflicting edits.

Another notification is the **Job Successfully Created** Alert. An alert appears at the top center of the map space.


***Figure 61: Job Successfully Created Alert***

These types of notifications occur for many other types of actions and need to be looked at carefully.

# Section 8. GRID Administration Module

This section is intended for GRID administrators and describes how to manage access privileges for users of the GRID application. By assigning a user to the appropriate groups and roles, you control the job functions that the user can complete, to whom the user can assign a job, and the RAI and LRS assets to which the user has access.

## 8.1 Launching the GRID Administration Module

The GRID Administration module is available on the GRID Launch page.

Click the **GRID Administration** icon to launch the GRID Administration module.

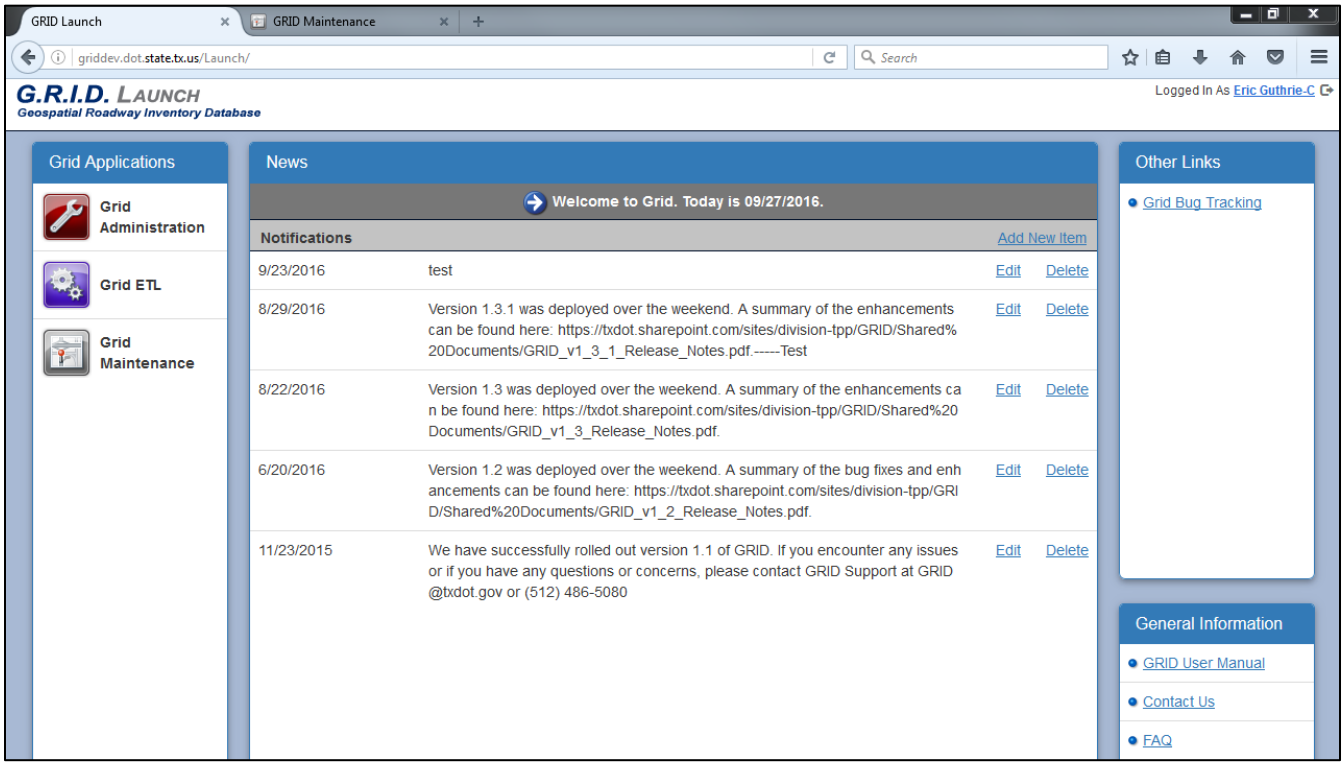



Figure 62: GRID Launch Page with GRID Administration and Notifications

## 8.2 Completing User Registration

For a user to gain access to GRID, they must attempt to launch the GRID application by accessing the GRID URL (http://grid.txdot.gov) with their Internet browser. The system authenticates whether the user is a member of the TxDOT domain. If the user is a TxDOT domain member, the following occurs:

- The GRID web page displays a notification to the user indicating that they have been authenticated and that a GRID administrator will complete their registration.

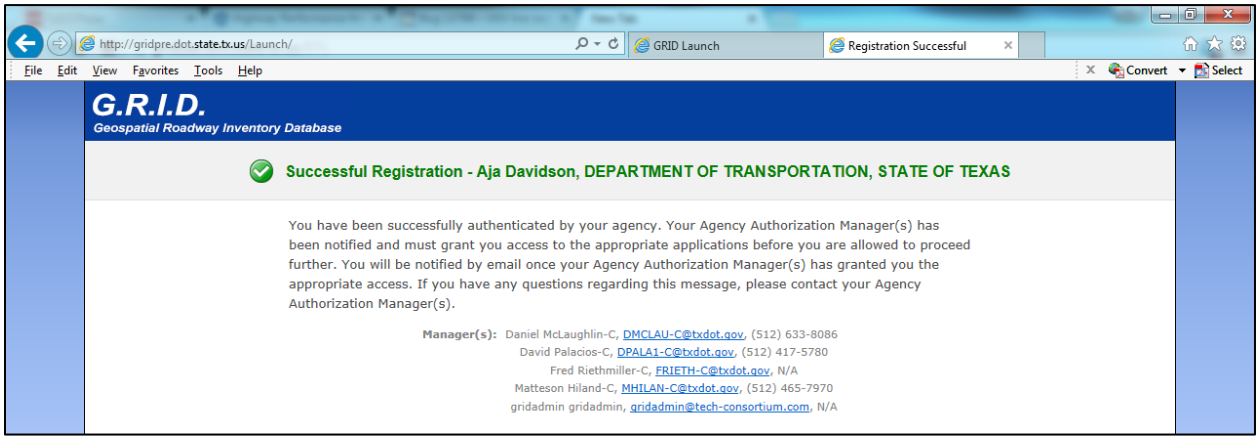



***Figure 63: Successful GRID Registration***

- An e-mail is sent to the GRID administrators indicating that a new user has requested access.

**Note:** *The e-mail notification does not indicate the user's district or provide information related to their group and role assignment. Contact the TPP staff either by phone (512-486-5080) or email (grid@txdot.gov) if you need direction on which groups and roles are appropriate for the new user.*

You can identify which users have requested GRID access through the following methods:

- Receipt of the notification e-mail.
- A notification is displayed the next time you launch the GRID Administration module. Click **Review** in the notification to display a list of new users requesting GRID access.
- The name of the user requesting access is italicized on the **Configure Agency Users** screen.

The following graphic shows the new user notification and italicized name on the **Configure Agency Users** screen.

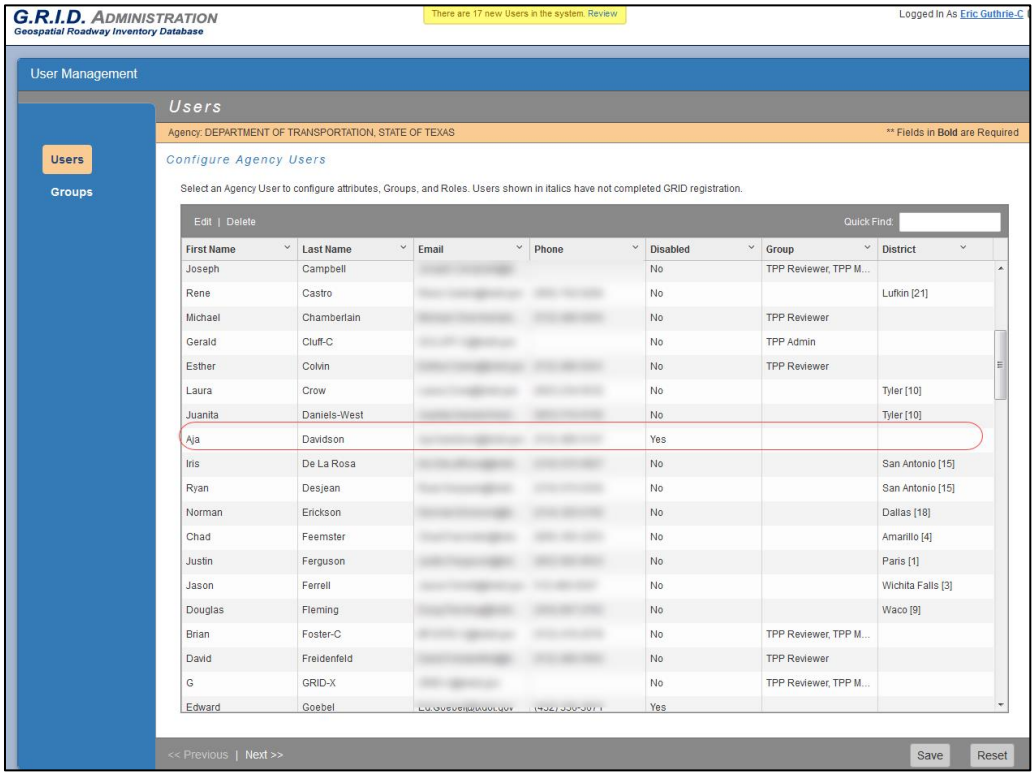



***Figure 64: Notification and Italics Indicating a New User Request***

On the **Configure Agency Users** screen, you can sort the user list by clicking a column heading or locate a user with the **Quick Find** search box. The **Quick Find** search retrieves results from the **First Name**, **Last Name**, and **Email** columns.

The quickest way to complete the new user registration is to click **Review** in the notification and then complete the registration process. This method, however, does not display all available user information nor does it indicate how user roles are inherited from the group assignment.

The other method is to double-click the italicized user name from the list on the **Configure Agency Users** screen. This is the recommended method because it displays additional user information and indicates which roles are inherited from a group assignment. This method will be covered in further detail in the next section.

After you complete the user registration, the new user receives an e-mail containing the URL for accessing GRID and a list of the GRID administrators (including e-mail and phone number) whom the user can contact if they have questions.

**Tip!** *The e-mail the new user receives does not indicate the user's group and role assignments. If you want to communicate this information, you need to send an e-mail to the user.*

### 8.2.1 How to Complete User Registration from the Configure Agency Users Screen

The following procedure assumes that you have received a notification indicating that a user has requested GRID access.

To complete the user registration:

1. Access the GRID application and launch the **GRID Administration** module.
2. With the **Users** tab selected in the left panel, double-click the new user's name from the list on the **Configure Agency Users** screen. The names of new users are in italics. You can also search for the user's name in the **Quick Find** search box.
3. By default, the new user **Employee Type** is **TPP** on the **User Information** screen. This designation gives the user access to LRS and RAI jobs for the entire state. If the **TPP** designation is not correct, then select **Non-TPP**. The **Non-TPP** designation limits the user to a particular district. If **Non-TPP** is chosen as the **Employee Type**, you must assign a **District** from the drop-down menu.

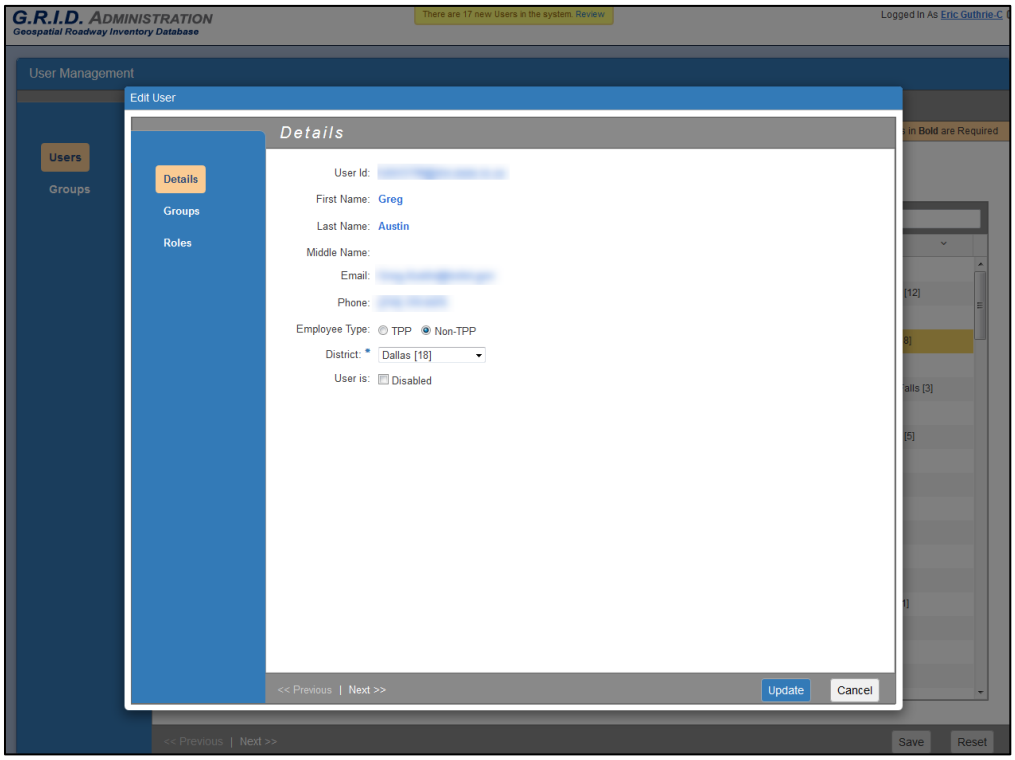



***Figure 65: User Information Screen***

4. Deselect **Disabled**. (When selected, the **Disabled** setting prevents the user from having access to GRID.)

5. Click **Next**.

   This action closes the **User Information** screen and goes back to the **Configure Agency Users** screen.

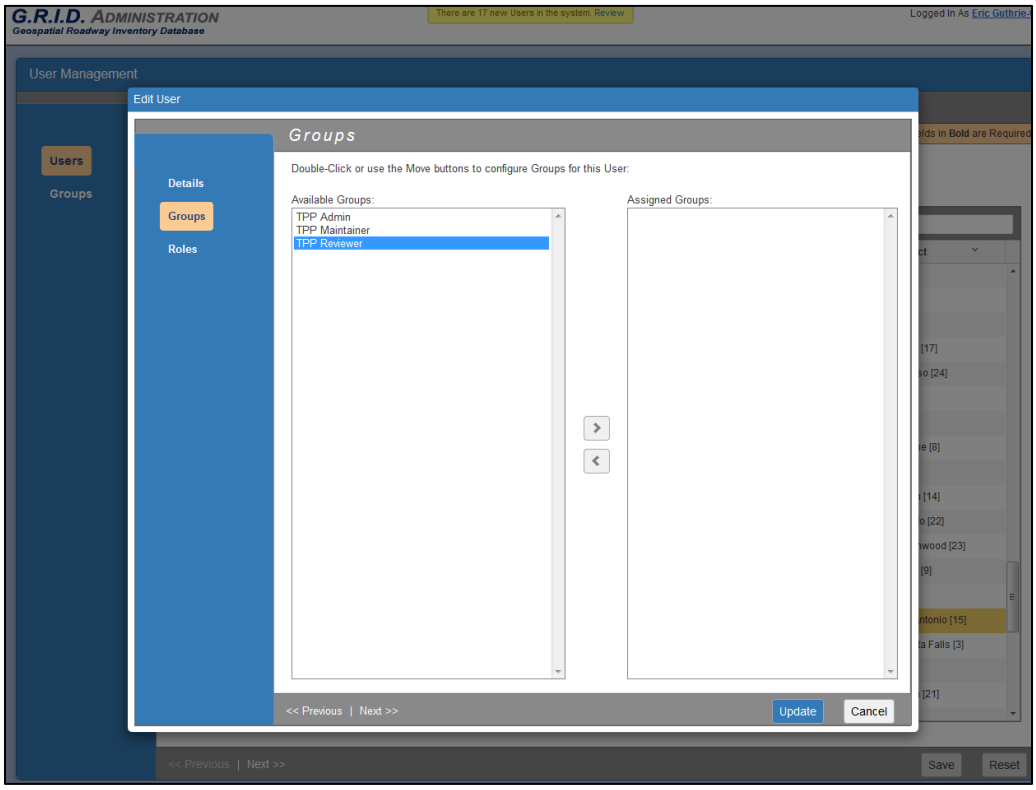



***Figure 66: Groups Screen***

6. Select the group that you are assigning the user to and move it to **Assigned Groups** using the **>>** button or by double clicking the group. You can assign the user to more than one group.

   If you make a mistake, you can unassign a group by returning it to **Available Groups** with the **<<** button.

7. Click **Next**.

   This action displays the **Roles** screen. Note that under **Inherited Role**, you can see the roles that are automatically assigned to the user based on the user's group assignment. The role inheritance is controlled by the groups displayed under **Group(s) Inherited From**.

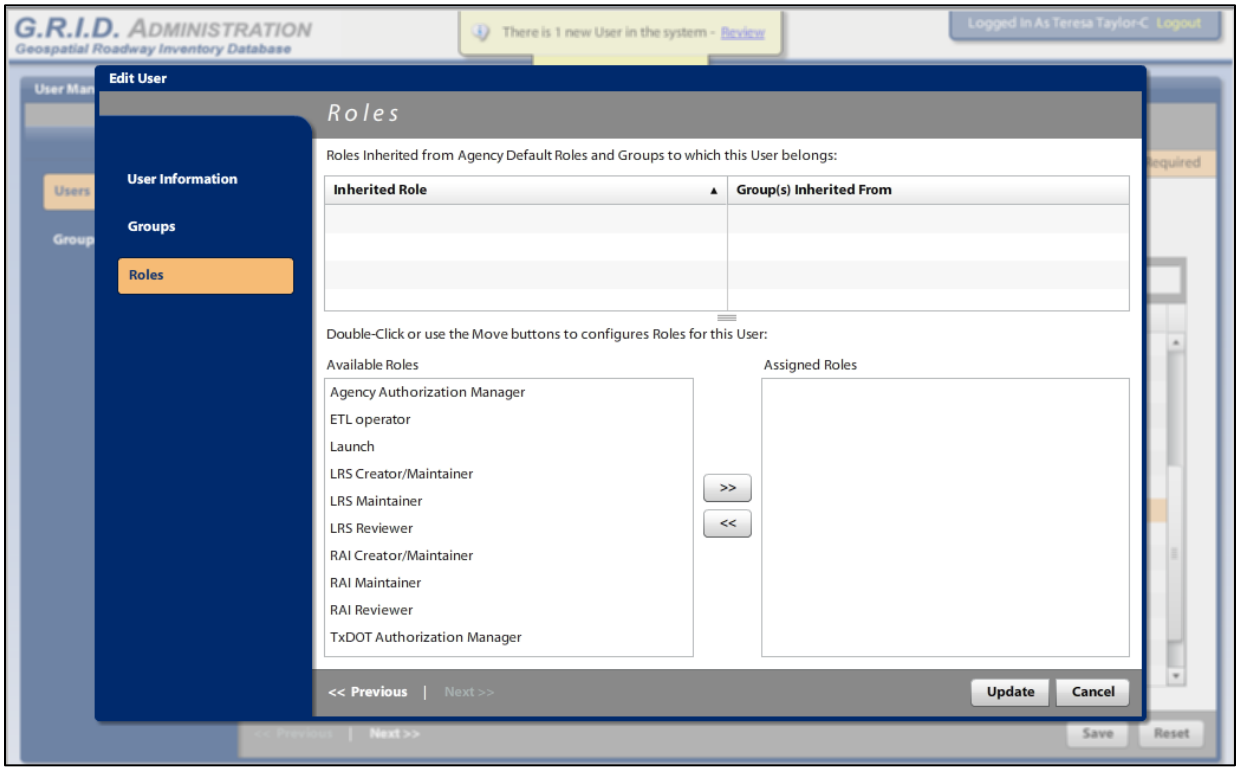



***Figure 67: Roles Screen***

8. Assign additional roles to the user as required by using the **>>** button to move the role from **Available Roles** to **Assigned Roles**.
9. Click **Update**. This action closes the **User Information** window and returns you to the **Configuration Agency Users** screen. If you want to exit the registration process without assigning groups or roles, click **Cancel**.
10. Click **Save**. The new user is now registered for GRID access with the group assignment and roles you specified. If you want to exit the registration process without assigning groups or roles, click **Reset**.

### 8.2.2 How to Complete User Registration from the New User Notification

The following procedure assumes that:

- You have completed the instructor led Introduction to GRID (PLN216) course
- You have received a notification indicating that a user has requested GRID access.
- You are familiar with how user roles are inherited based on group assignment. (If you are uncertain of role inheritance, use the *How to Complete User Registration from the Configure Agency Users Screen* procedure in section 8.2.1.

To complete the user registration:

1. Access the GRID application and launch the **GRID Administration** module.
2. Click **Review** on the new user notification displayed at the top of the **Users** screen.
3. On the **New User Registration** screen, double-click the name of the user for whom you want to complete the registration.

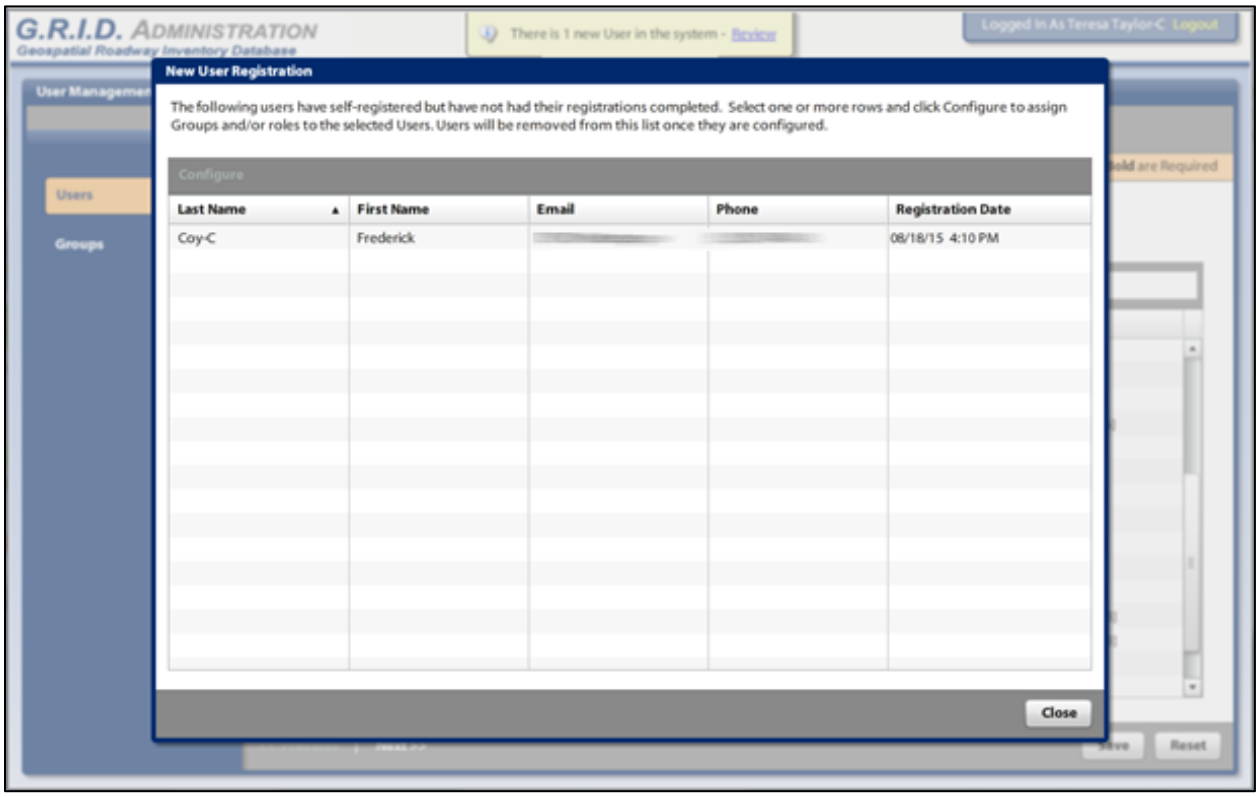



***Figure 68: New User Registration Screen: Configure***

4. On the **Groups** tab, select the group you are assigning the user to and move it to **Assigned Groups** with the **>>** button or by double clicking the group. You can assign the user to more than one group.

   **Note:** *The user is automatically assigned roles inherited from their Group assignment.*

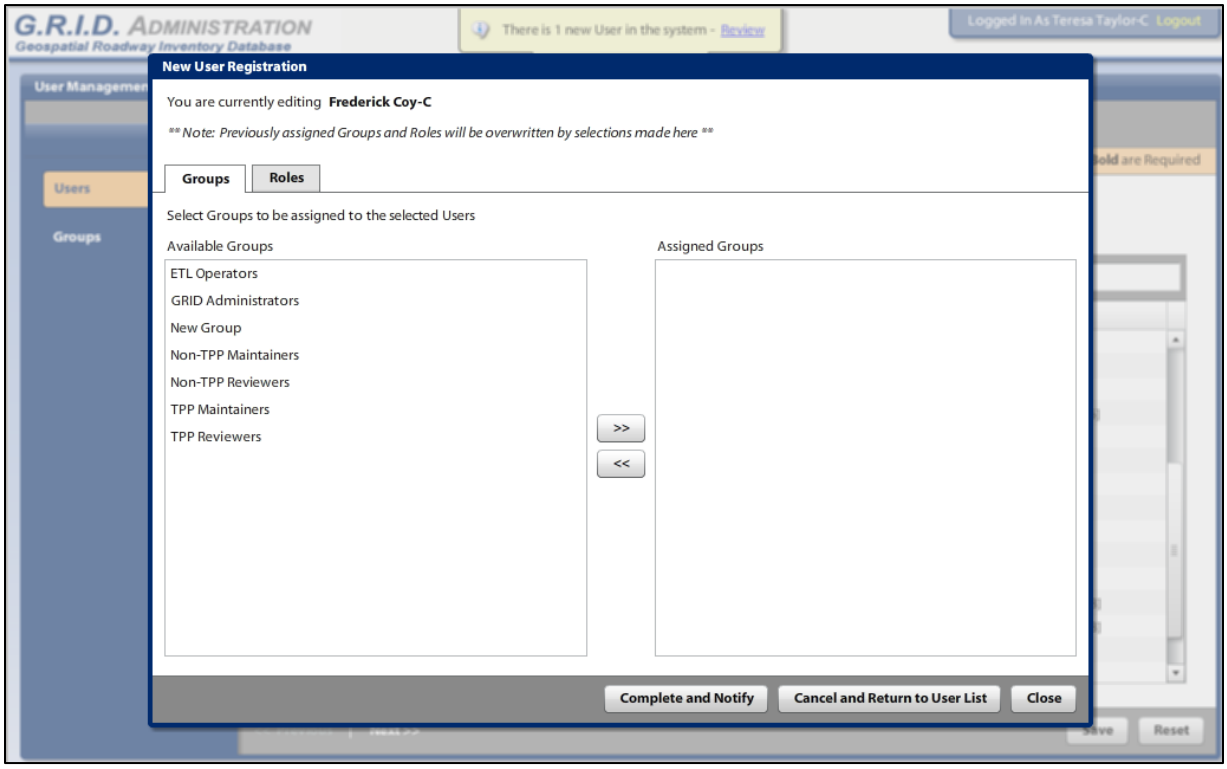



***Figure 69: New User Registration Screen: Groups and Roles***

5. Click **Complete and Notify** and then **Close**. If you want to exit the registration process without assigning groups or roles, click **Cancel and Return to User List**.

6. Click **Confirm** when prompted. The user is now registered with the group assignment and roles you specified.

## 8.2.3 Creating Groups

Creating Groups is done by accessing the Groups tab in the left panel. Not only can groups be created in this tab, multiple users can be assigned to a single group in bulk.

## 8.3 Preventing Conflicting Updates by Multiple GRID Administrators

Although the GRID application enables more than one person to be a GRID administrator, only one administrator at a time can have administrative access to the GRID Administration module. This limitation prevents administrators from making conflicting changes.

If you launch the GRID Administration module while another administrator is already working in the module, you receive a **Concurrent Edit Warning** notification with the option to:

- **Open Read-Only.** You can view information in the module but cannot make changes.
- **Unlock and Open.** You can enter the module with full administrative privileges and make changes. The previous administrator is "locked out" and prevented from making further updates.

  **Tip!** *Selecting **Unlock and Open** might cause the previous administrator to lose any unsaved updates. If possible, contact the administrator identified in the **Concurrent Edit Warning** and make sure it is safe for you to continue with the **Unlock and Open** option.*

  **Tip!** *See section 8.4 Exiting the GRID Administration Module for instructions on exiting the module in a manner that avoids conflicts with other administrators.*

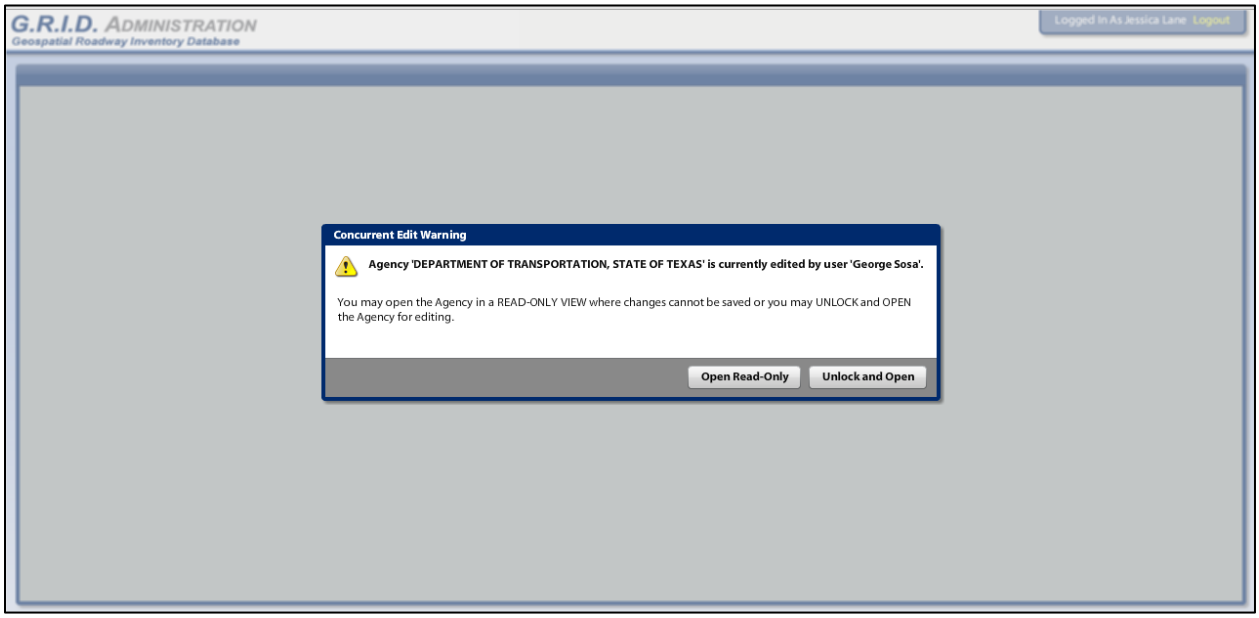



***Figure 70: Concurrent Edit Warning Notification***

You might be working in the GRID Administration module when another administrator selects the Unlock and Open option. In this case, if you attempt to save changes, you receive the **Error Occurred** notification indicating that your changes cannot be saved.

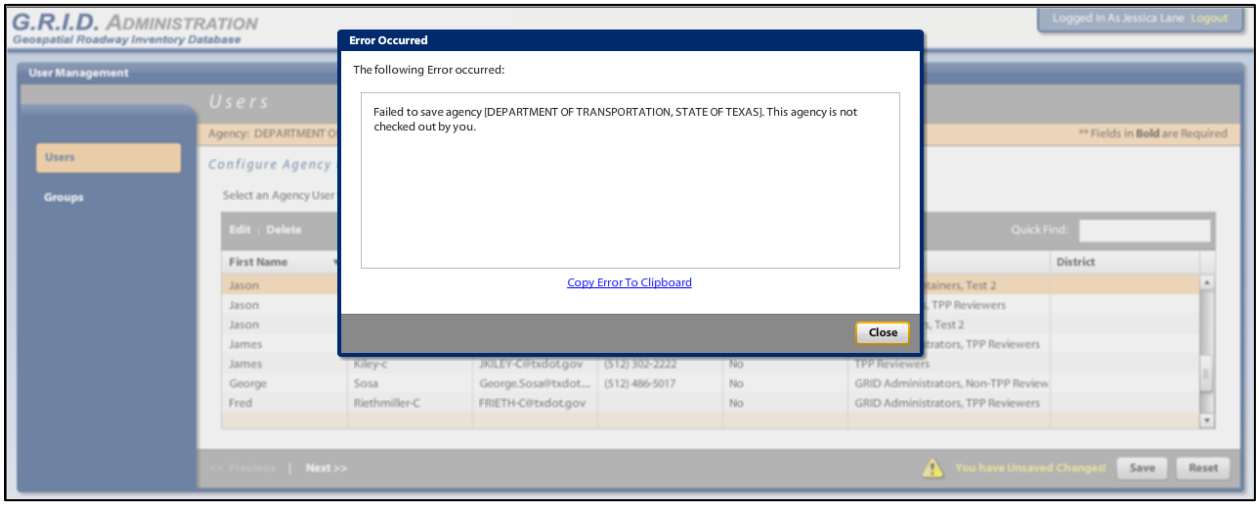



***Figure 71: Error Occurred Notification***

In this situation, clicking **Close** and then **Reset** reloads the GRID session and displays the **Concurrent Edit Warning** notification which enables you to re-enter GRID and lock out the other administrator. You still lose your unsaved changes, however, after clicking **Reset**.

## 8.4 Exiting the GRID Administration Module

In order to fully exit the GRID Administration module, the Launch page needs to be logged out of.

# Appendix A: Highway System Classifications

| Initial | Highway System |
|---|---|
| IH | Interstate Highway |
| US | US Highway |
| UA | US Alternate Highway |
| UP | US Highway Spur |
| SH | State Highway (Includes NASA and OSR) |
| SA | State Alternate Highway |
| SL | State Highway Loop (Includes Beltway) |
| SS | State Highway Spur |
| BI | Off Interstate Business Route |
| BU | Off US Highway Business Route(Includes US Alternate) |
| BS | Off State Highway Business Route (Includes SH Alternate) |
| BF | Off Farm or Ranch to Market Roads Business Routes |
| FM | Farm to Market Road |
| RM | Ranch to Market Road |
| RR | Ranch Road |
| PR | Park Road |
| RE | Recreation Road |
| RP | Recreation Road Spur |
| FS | Farm to Market Road Spur |
| RS | Ranch to Market Road Spur |
| RU | Ranch Road Spur |
| PA | Principal Arterial Street System |
| NA | Toll Road |
| CR | County Road |
| FC | Functionally Classified City Street |
| CS | Local City Street |
| FD | Federal Road |

# Appendix B: Error Messages

Below is a list of the known Error messages in GRID.

| Message ID | Message Text |
|---|---|
| 0.0 | {0} |
| 0.1 | {0} |
| 0.2 | {0} |
| 0.3 | {0} |
| 1.1 | {0} may not be null. |
| 1.2 | Invalid id {1} for domain field: {0} |
| 1.3 | Invalid id {1} for database lookup field: {0} |
| 1.4 | Invalid length for {0}. Minimum length {2}, maximum length {3}. |
| 1.5 | Invalid number format for {0}. Should match format {4}.{5}. |
| 1.6 | Invalid number for {0}: {1}. Should be a maximum of {4}. |
| 1.7 | Invalid number for {0}: {1}. Should be a minimum of {4}. |
| 1.8 | Invalid value for {0}: {1}. Must be either 0 or 1. |
| 1.9 | Invalid value for {0}: {1}. Must be either Y or N. |
| 1009.2 | Effective Start Date must be less than Effective End Date when not null. |
| 1010.2 | Effective End Date must be greater than Effective Start Date when not null. |
| 1011.2 | Created By must have a value. |
| 1013.1 | Milepoint Date must not be null when change reason in (1,2,3,4,5,9). |
| 1014.1 | Change Reason must not be null. |
| 1025.1 | Control Section Number must have a value. |
| 1025.2 | Invalid gap after Control Section. |
| 1025.5 | Control Section is required for all CL or K Route Definitions and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1027.1 | Begin milepoint measure must have a value. |
| 1027.2 | Begin milepoint measure cannot have more than 3 digits to the right of the decimal. |
| 1027.3 | Begin milepoint measure must be greater than or equal to zero. |
| 1027.4 | Begin milepoint measure must be less than end milepoint measure. |
| 1028.1 | End milepoint measure must have a value. |
| 1028.2 | End milepoint measure must have less than 4 digits to the right of the decimal. |
| 1028.3 | End milepoint measure must be greater than zero. |
| 1028.4 | End milepoint measure must be greater than begin milepoint |
| 1030.2 | Created Date must have a value. |

| Message ID | Message Text |
|---|---|
| 1034.1 | Multi-record flag must be either Yes or No. |
| 1015.1 | Reference Marker number must have a value. |
| 1015.2 | Reference Marker number must be greater than zero. |
| 1015.3 | Reference Marker number must be less than or equal to 9999. |
| 1015.4 | Reference Marker Numbers must occur in numeric order. |
| 1015.5 | Duplicate Reference Marker Numbers detected. |
| 1015.6 | Route Prefix must not be in ('FC','CR','CS','FD'). |
| 1011.1 | Created By must have a value. |
| 1030.1 | Created Date must have a value. |
| 1009.1 | Effective Start Date must be less than Effective End Date when not null. |
| 1010.1 | Effective End Date must be greater than Effective Start Date when not null. |
| 1014.2 | Reference Marker Change Reason must be Add for New reference marker records. |
| 1014.3 | Reference Marker Change Reason must not be Add for Modified reference marker records. |
| 1014.4 | Reference Marker Change Reason cannot be null. |
| 1007.1 | Roadbed Type must be indicated for all Routes. |
| 1009.3 | Effective Start Date must be less than Effective End Date when not null. |
| 1010.3 | Effective End Date must be greater than Effective Start Date when not null. |
| 1011.3 | Created By must have a value. |
| 1030.3 | Created Date must have a value. |
| 1039.1 | Cardinal Direction must have a value. |
| 2186.1 | Route Definition Type ID must be between 1 and 3. |
| 1002.1 | Route Number must have a value. |
| 1002.2 | Route Prefix must have a value when Route Number is not null. |
| 1002.3 | Route Prefix must have a value other than 'Not Applicable' when Route Number is populated. |
| 1003.1 | Route Number must have a value when Route Prefix is populated with a value other than 'Not Applicable'. |
| 1004.1 | Route Suffix must have a value other than 'I' or 'O' when Route Prefix is one of the following: 'BS','BI','BU','BF'. |
| 1004.2 | Route Suffix must have a value in 'N','S','E','W',or 'Not Applicable', when Route Prefix is not one of the following: 'PR','BS','BI','BU','BF'. |
| 1073.1 | Roadbed Types K, A, X must have Access Control |
| 1073.3 | Access Control must be Full when Functional System is Interstate and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 1048.1 | Alternate Route Name cannot contain \| symbols. |

| Message ID | Message Text |
|---|---|
| 1083.1 | Alternate Speed Limit is required when Alternate Speed Limit Type is not null. |
| 1083.2 | Alternate Speed Limit must be a multiple of 5 when not null. |
| 1083.3 | Alternate Speed Limit must be a positive integer. |
| 2159.1 | Section comment cannot include the '\|' character. |
| 2159.2 | Section Comment is Required if the HPMS Sample has a Facility Type of Two-way road with Number of Through Lanes > |
| 2176.5 | At-Grade Other Intersections is required for all HPMS Samples and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2176.2 | If HPMS Sample ID is not null and At Grade Other divided by the Length of the HPMS Sample is > 25 per mile, Section Comment is required. |
| 2176.3 | At Grade Other must be zero when Access Control equals 1 (full control). |
| 2176.4 | At Grade Other must be greater than or equal to zero. |
| 2191.1 | Cannot have the same Baseline Bearing Type code listed twice for the same Baseline Bearing. |
| 2192.1 | Baseline Bearing Degrees must be less than 360 degrees. |
| 2192.2 | Baseline Bearing Type 1 is required for all Baseline Bearing events. |
| 2192.3 | Baseline Bearing Degrees is required for all Baseline Bearings on roadways where Route Prefix not in (County Roads (CR), Local City Street (CS), Federal Roads (FD), or Functionally Classified City Streets (FC)). |
| 2192.4 | Baseline Bearing Degrees must be in decimal degrees format. |
| 2193.1 | Baseline Bearing Begin Direction is required for all On-system routes where a BLB point exists. |
| 2193.2 | Only one Baseline Bearing Beginning Direction record is allowed per BLB point location. |
| 2194.1 | Baseline Bearing End Direction is required for On-system routes where a BLB point exists. |
| 2194.2 | Only one Baseline Bearing Ending Direction record is allowed per BLB point location. |
| 2195.1 | Baseline Bearing Location Comment is required for all roadways where Route Prefix not in (County Roads (CR), Local City Street (CS), Federal Roads (FD), or Functionally Classified City Streets (FC)) and where a BLB point exists and BLB Type code is 4 (Baseline Location). |
| 2197.1 | Baseline Bearing Location ID must be a positive integer value. |
| 2198.1 | Baseline Bearing Location Offset must be a positive value in feet to 2 decimal places. |

| Message ID | Message Text |
|---|---|
| 2198.2 | Baseline Bearing Location Offset is required for all Baseline Bearings on roadways where Route Prefix not in (County Roads (CR), Federal Roads (FD), Local City Street (CS), or Functionally Classified City Streets (FC)) and BLB Type code is 4 (Baseline Location). |
| 2199.1 | Baseline Bearing Entering Curve ID must be a valid Curve ID. |
| 2200.1 | Baseline Bearing Exiting Curve ID must be a valid Curve ID. |
| 2073.1 | Base Thickness must be an integer value greater than or equal to 0 and less than 99 relating Base Pavement thickness to the nearest inch. |
| 2073.2 | Base Thickness is required for all Paved (Surface Type in 1-11) HPMS Samples and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 1080.1 | Base Type is required for all records located on routes with Route Prefix NOT in (County Roads, Functionally Classified Streets, Federal Roads, or Local City Streets) and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 1080.2 | Base Type is required for all records with HPMS Samples located on routes with Route Prefix in (County Roads, Functionally Classified Streets, Federal Roads, or Local City Streets) and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2248.1 | Boundary ID is required for Boundary Types in (B,C,D,E). |
| 2248.2 | Intersecting Feature - Crossing Angle is required. |
| 2248.3 | Intersecting Feature - Feature Begin/End is required. |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2155.1 | For all Bridges, Intersecting Feature - Crossing Feature Grade must be either 'At Grade' or 'Above Grade'. |
| 2155.2 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2232.1 | Bridge Number must be a 15 digit string consisting of District ID (01-25), County Number (001-254), Control Section (0001-01 - 9999-99) and Bridge Number (001-999). |
| 2138.1 | Roadbed Type must be 'K'. |
| 2138.2 | Intersecting Feature - On Route Grade must be G. |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2184.1 | Climate Zone is required for all Paved (Surface Type in 1-11) HPMS Samples and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2157.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2157.2 | All Cemeteries must have a valid point location provided on the roadbed indicated. |

| Message ID | Message Text |
|---|---|
| 1066.2 | Control Sections are required for all On-System routes with a Roadway Status of 3, 4, or 6, and are missing at the location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2168.1 | Counter Peak Lanes is required for all HPMS Samples and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2168.2 | Counter Peak Lanes count should be an Integer greater than 0. |
| 2168.3 | The number of Peak and Counter-Peak Lanes should be greater than or equal to the total Number of Through Lanes (i.e., Peak Lanes + Counter-Peak Lanes > |
| 2132.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', or 'T'. |
| 2132.2 | Intersecting Feature - Crossing Feature Grade must be 'At Grade'. |
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |
| 2239.1 | Culvert - Pipe Diameter is required if Culvert Type |
| 2240.1 | Culvert - Pipe Count is required if Culvert Type |
| 2240.2 | Culvert - Pipe Count must be an integer greater than zero when populated. |
| 2241.1 | Culvert - Box Culvert Size is required if Culvert Type |
| 2122.1 | Intersecting Feature - Crossing Angle must be > |
| 2242.1 | Culvert - Fill Depth must be 0-99 feet. |
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |
| 2257.1 | Curve Class - The length of all curve classes for an HPMS Sample must be equal to the HPMS Sample length. Total length of curve classes: {0}. HPMS sample length: {1}. |
| 2258.1 | Curve Class - One of each of the Curve Class types is required for all HPMS Samples where Surface Type is in 1-11 (Paved) and Functional System is in 4 (Minor Arterial) and the HPMS Sample segment falls outside of all Urban/UZA polygons. The following types are missing {0}. |
| 2258.2 | Curve Class - One of each of the Curve Class types is required for all HPMS Samples where Surface Type is in 1-11 (Paved) and Functional System is in 2 or 3 (Principal Arterials). The following types are missing {0}. |
| 2070.1 | A Point of Intersection Curve should not have associated Curve Component records. |
| 2098.1 | A Normal Curve must have exactly 2 Curve components specified, indicating the beginning point and ending point. |
| 2098.2 | A Spiral Curve must have either 3 or 4 components specified, consisting of a valid combination of the following: beginning point of Spiral curve, second point of Spiral curve, third point from beginning of Spiral curve, end point of Spiral curve. |

| Message ID | Message Text |
|---|---|
| 2099.1 | Curve Tangent Length must be specified for each Curve Point of Tangency 1 record. |
| 2099.2 | Curve Point of Tangency 1 is required for all Curve events with Curve Type of Normal or Spiral. |
| 2100.1 | Curve Tangent Length must be specified for each Curve Point of Tangency 2 record. |
| 2100.2 | Curve Point of Tangency 2 is required when a Curve linear event is present for roadway segments with Route Prefix not in (County Roads (CR), Local City Street (CS), Federal Roads (FD), or Functionally Classified City Streets (FC)) and Curve Type is Spiral. |
| 2101.1 | Curve Degree of Curvature must be < 91 degrees when Curve Type |
| 2101.2 | Curve Degree of Curvature must be in Decimal Degrees format. |
| 2101.3 | Degree of Curvature is required for all curve linear events with curve type of Normal or Spiral. |
| 2104.1 | Curve Delta Angle Must be less than or equal to 360 degrees. |
| 2104.2 | Curve Delta Angle is required when a Curve linear event is present for roadway segments with Route Prefix not in (County Roads (CR), Local City Street (CS), Federal Roads (FD), or Functionally Classified City Streets (FC)). |
| 2104.3 | Curve Delta Angle must be in decimal degrees format with three decimal places of precision allowed. |
| 2105.1 | Curve length is required for all curve linear events except curve type: Point of Intersection. |
| 2105.2 | Curve Length must be greater than or equal to zero. |
| 2189.1 | Curve Delta Right/Left is required for all curve linear event records that are located on roadway segments where Route Prefix not in (County Roads (CR), Local City Street (CS), Federal Roads (FD), or Functionally Classified City Streets (FC)). |
| 2190.1 | Curve Tangent Length must be a positive numeric value with 4 decimal places, if not null. |
| 2201.1 | Degree of Curvature is required for all curve linear events with curve type: Point of Intersection. |
| 2076.1 | Date Closed To Traffic must be > 1/1/1962 and < System Date + 1. |
| 2076.2 | Date Closed To Traffic is required for all locations with Roadway Status set to Temporarily Closed to Traffic and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2075.1 | DateOpenedToTraffic must be > 1/1/1962 and < System Date + 1. |
| 2075.2 | Date Opened To Traffic is required for all locations where Roadway Status is either Open, but with some Construction, or Open to Traffic - All Data Input, and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2127.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |

| Message ID | Message Text |
|---|---|
| 2127.2 | Feature Left/Right of Roadway must be indicated as related to ascending mileage direction. |
| 2127.3 | All Driveways must have a valid point location provided on the roadbed indicated. |
| 2127.4 | Feature Notation is required. |
| 2156.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2156.2 | All Fire Plugs must have a valid point location provided on the roadbed indicated. |
| 2216.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2216.2 | All Ferries must have a valid point location provided on the roadbed indicated. |
| 2005.1 | If Route Prefix is PA, then Functional System must exist and must be in (Principal Arterial - Other, Minor Arterial, Major Collector, Minor Collector). |
| 2005.2 | If Route Prefix does not indicate County Road, Park Road, or Recreational Road, then Functional System is required and must be in (Interstate, Principal Arterial - (Other Freeways and Expressways), Principal Arterial - Other, Minor Arterial, Major Collector, or Minor Collector). |
| 2005.3 | If Route Prefix is County Road, Park Road, or Recreational Road, and Functional System exists, then Functional System must be in (Principal Arterial - (Other Freeways and Expressways), Principal Arterial - Other, Minor Arterial, Major Collector, Minor Collector, or Local). |
| 2005.4 | If Functional System is Interstate, then Access Control must be Full Control. |
| 2005.6 | Functional System is required and is missing for a portion of this Route at Location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2139.1 | Intersecting Feature - On Route Grade must be G for all Gates. |
| 2139.2 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2004.1 | Government Control Level is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1078.2 | High Occupancy Vehicle (HOV) Lane count must be less than or equal to Number of Through Lanes. |
| 1078.3 | High Occupancy Vehicle (HOV) Lane count must be a positive whole number > 0. |
| 1078.4 | High Occupancy Vehicle (HOV) Lane is required where HOV Facilities > 0 and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |

| Message ID | Message Text |
|---|---|
| 1077.1 | High Occupancy Vehicle (HOV) Facility is required and is missing for a portion of this Route at Location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2149.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2149.2 | All Historical Markers must have a valid point location provided on the roadbed indicated. |
| 2064.1 | HPMS Sample Begin Termini must be 64 alpha-numeric characters or less. |
| 2065.1 | HPMS Sample End Termini must be 64 alpha-numeric characters or less. |
| 2083.1 | HPMS Sample Number must be unique. |
| 1095.1 | Inside Shoulder Type is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1098.1 | Full coverage for Inside Shoulder Use required for all Urban HPMS Samples and is missing at HPMS Sample location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1098.2 | If Functional System |
| 2255.1 | Inside Shoulder Use - Time of Day Begin must be a valid Time in HH:MM format if Inside Shoulder Use - Time of Day Begin is not null. |
| 2256.1 | Inside Shoulder Use - Time of Day End must be a valid Time in HH:MM format if Inside Shoulder Use - Time of Day Begin is not null. |
| 2051.1 | Inside Shoulder Width - Section Comment is required if Inside Shoulder Width > 12. |
| 2051.2 | If Inside Shoulder Type is not equal to 0 (None or Inadequate) then Inside Shoulder Width must be > 0. |
| 2051.3 | Inside Shoulder Width is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2051.4 | Inside Shoulder Width must be an integer value greater than or equal to zero. |
| 2177.1 | If Lane Width < 6 or > 18, then a Section Comment must be present. |
| 2177.2 | Lane Width must be > 0 on sections with Roadway Status in (4 - Open, but with some construction, 6 - All Data Input). |
| 2177.3 | Lane Width must be greater than or equal to zero. |
| 2177.4 | Lane Width is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2093.1 | Last Overlay Thickness is required for all paved HPMS Samples. |
| 2093.2 | Last Overlay Thickness must be a number with one decimal place, populated to the nearest .5 inch. |

| Message ID | Message Text |
|---|---|
| 2170.1 | Number of Left Turn Lanes are required for Route sections with Functional System in ( Interstate, Principal Arterial - (Other Freeways and Expressways), Principal Arterial - Other, Minor Arterial, Major Collector) that are within an Urban/Urbanized Area polygon, and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2170.2 | If exists, must be 1 if no Intersection point events exist along the same extents. |
| 2170.3 | If exists, must not be 1 when Intersection point events exist along the same extents. |
| 2148.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2148.2 | All Litter Barrels must have a valid point location provided on the roadbed indicated. |
| 1070.2 | Maintenance Section is required for all State Maintained Routes and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2152.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2152.2 | All Material Stockpiles must have a valid point location provided on the roadbed indicated. |
| 1081.1 | If Maximum Speed Limit is less than 50MPH and Functional System |
| 1081.2 | Maximum Speed Limit must be a multiple of 5. |
| 1081.3 | Maximum Speed Limit must be < 86 MPH. |
| 1081.4 | Maximum Speed Limit is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1081.5 | Maximum Speed Limit must be a positive integer value. |
| 2054.2 | Median Type is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2054.3 | If Number of Through Lanes |
| 2178.2 | Median Width Must be > 0 when Median Type <> None. |
| 2178.3 | Median Width must be a positive whole number. |
| 2178.4 | Median Width is required on HPMS Samples and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2055.1 | Minimum Right Of Way Width must be entered for locations with Route Prefix not in (County Roads (CR), Local City Street (CS), Federal Roads (FD), or Functionally Classified City Streets (FC)). |
| 2055.2 | Minimum Right of Way (ROW) Width is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2055.3 | Minimum Right Of Way Width must be a numeric value greater than or equal to zero. |

| Message ID | Message Text |
|---|---|
| 2055.4 | Minimum Right Of Way Width must be equal to or greater than the sum of all Roadbed Widths plus Median Widths at Location: {3} Minimum ROW Width {0} Roadbed Width: {2} Median Width: {1} |
| 2055.5 | Minimum Right Of Way Width can't be greater than usual ROW width. |
| 1082.1 | Minimum Speed Limit must be < Maximum Speed Limit. |
| 1082.4 | Minimum Speed Limit must be a numeric value greater than or equal to zero. |
| 1082.5 | Minimum Speed Limit must be a multiple of 5. |
| 1082.6 | Minimum Speed Limit is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2202.2 | NHS Approval Date must be greater than 1997. |
| 2202.3 | National Highway System (NHS) is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2174.1 | Number of Signals is required for all HPMS Samples and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2174.2 | Number of Signals must be zero when Access Control |
| 2174.3 | Number of Signals must be an integer value. |
| 2174.4 | Number of Signals must be greater than or equal to zero when populated. |
| 2175.1 | Number of Stop Signs is required for all HPMS Samples and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2175.2 | Number of Stop Signs must be zero when Access Control equals 1 (full control). |
| 2175.3 | Number of Stop Signs must be a positive integer value greater than or equal to zero. |
| 1092.1 | If Number of Through Lanes |
| 1092.2 | Number of Through Lanes must be <> Peak Lanes when on an HPMS Sample contained in a Urban Area/UZA polygon where Facility Type is Two- way. |
| 1092.2 | Number of Through Lanes must be <> Peak Lanes when on an HPMS Sample contained in a Urban Area/UZA polygon where Facility Type is Two- way. |
| 1092.3 | Number of Through Lanes is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1092.4 | Numeric value greater than or equal to 0. |
| 1092.5 | If Roadway Status in (4, 6), Number of Through Lanes must be > 0. |
| 2143.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |

| Message ID | Message Text |
|---|---|
| 2143.2 | Feature Notation is required. |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |
| 2246.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2246.2 | Feature Left/Right of Roadway must be indicated as related to ascending mileage direction for all Other Roadside Features. |
| 2246.3 | Feature Notation is required for all Other Roadside Features. |
| 2215.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2215.2 | Feature Notation is required for all Other Roadway Features. |
| 1096.1 | Outside Shoulder Type Must not be |
| 1096.3 | Outside Shoulder Type is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1097.1 | Outside Shoulder Use is required for all Urban HPMS Samples and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1097.2 | If Functional System |
| 2255.2 | Outside Shoulder Use - Time of Day Begin must be a valid Time in HH:MM format if Outside Shoulder Use - Time of Day Begin is not null. |
| 2256.2 | Outside Shoulder Use - Time of Day End must be a valid Time in HH:MM format if Outside Shoulder Use - Time of Day Begin is not null. |
| 2052.1 | Outside Shoulder Width is required for all HPMS Sample sections and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2052.2 | If Outside Shoulder Width > 12, must include Section Comment. |
| 2052.3 | If Outside Shoulder Width < 8, and Functional System is Interstate, must include Section Comment. |
| 2052.4 | Outside Shoulder Width Must be |
| 2052.5 | Outside Shoulder Width Must be > 0 when Outside Shoulder Type not in None or Inadequate. |
| 2052.6 | Outside Shoulder Width must be an Integer greater than or equal to zero. |
| 2003.1 | Ownership is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2142.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2142.2 | Intersecting Feature - Crossing Feature Grade must be 'Above Grade'. |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |

| Message ID | Message Text |
|---|---|
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |
| 2213.1 | Pavement Treatment Date is required for all new or modified Pavement Treatment records. |
| 2213.2 | Pavement Treatment Date must be after 12/31/1917. |
| 2264.1 | Pavement Treatment Depth is required for all new or modified Pavement Treatment records. |
| 2264.2 | Pavement Treatment Depth only allows one decimal place of precision. |
| 2095.1 | Pavement Thickness Flexible is required for all HPMS Samples where Surface Type indicates paved. |
| 2095.2 | Pavement Thickness Rigid must be specified to the nearest .5 inch. |
| 2096.1 | Pavement Thickness Rigid is required for all HPMS Samples where Surface Type indicates paved. |
| 2096.2 | Pavement Thickness Rigid must be specified to the nearest .5 inch. |
| 2204.1 | Peak Direction Toll is required for HPMS Samples. |
| 2167.1 | Peak Lane Count must be greater than 0. |
| 2167.2 | Peak Lanes is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2167.3 | Peak Lane Count must be equal to Number of Through Lanes if not in an Urban Area/UZA polygon. |
| 2167.4 | Peak Lane Count must be less than the Number of Through Lanes when the section falls within an Urban Area/UZA polygon and Facility Type indicates Two-way and the Roadway section is an HPMS Sample. |
| 2167.4 | Peak Lane Count must be less than the Number of Through Lanes when the section falls within an Urban Area/UZA polygon and Facility Type indicates Two-way and the Roadway section is an HPMS Sample. |
| 2167.5 | If the section is not in an Urban/UZA Area polygon and Facility Type indicates Two-way with Number of Through Lanes > 3, Peak Lane Count must be > |
| 2167.5 | If the section is not in an Urban/UZA Area polygon and Facility Type indicates Two-way with Number of Through Lanes > 3, Peak Lane Count must be > |
| 2167.6 | Peak Lanes is required for all HPMS Samples and is missing at Location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2179.1 | Peak Parking is required for all Urban HPMS Samples. |
| 2179.2 | If Functional System |
| 2136.1 | Pedestrian Passageway - Crossing Feature Grade must be in ('Above Grade','Below Grade'). |
| 2136.2 | Intersecting Feature - On Route Structure Number is required if Intersecting Feature - Crossing Feature Grade |

| Message ID | Message Text |
|---|---|
| 2136.3 | Intersecting Feature - On Route Structure Number must be null if Intersecting Feature - Crossing Feature Grade |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2173.1 | Percent Green Time is required for all Urban HPMS Samples and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2173.2 | Percent Green Time must be |
| 2173.3 | Percent Green Time must be > 0 when Traffic Control is not |
| 2173.4 | Percent Green Time must be > 0 when Number of Signals > 0. |
| 2173.5 | Section Comment is required if Percent Green Time greater than or equal to 86%. |
| 2173.6 | Section Comment is required if Functional System is Principal Arterial - (Other Freeways and Expressways) or Principal Arterial - Other and segment is contained in an Urban Area/UZA GIS polygon and Percent Green Time is greater than 90%. |
| 2173.7 | Section Comment is required if Functional System is Principal Arterial - Other and segment is contained in an Urban Area/UZA GIS polygon and Percent Green Time is greater than 80%. |
| 2173.8 | When populated, Percent Green Time must be > |
| 2173.9 | Percent Green Time must be an integer value. |
| 2183.1 | Percent Passing Sight Distance is required for all Rural Paved (Surface Type in 1-11) HPMS Samples with a Roadway Design in (One Way, Two Way), and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2183.2 | Percent Passing Sight Distance must be an integer > 0 and < 100. |
| 2145.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2145.2 | All Picnic Areas must have a valid point location provided on the roadbed indicated. |
| 2125.3 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', 'Y', or 'NA'. |
| 2125.4 | Pipeline Crossing - Crossing Feature Grade must be in ('Above Grade','Below Grade'). |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |
| 2254.1 | Present Serviceability Rating Date must be in the last 50 years. |
| 2254.2 | Present Serviceability Rating Date is required for all new assets. |
| 2088.1 | Present Serviceability Rating must be coded to the nearest tenth of an inch. |
| 2088.2 | Present Serviceability Rating (PSR) is required for all HPMS Samples where IRI is not present and Functional System is |
| 2088.3 | Present Serviceability Rating (PSR) is required for all HPMS Samples where IRI is null and Functional System is |

| Message ID | Message Text |
|---|---|
| 2088.4 | Present Serviceability Rating (PSR) is required for all HPMS Samples where IRI is null and Functional System is |
| 2128.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2224.1 | Railroad DOT Number required for all Railroad Crossing type Intersecting Feature events. |
| 2224.2 | Railroad DOT Number must be a six-digit railroad number + one-letter identifier. |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2144.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2144.2 | All Rest Areas must have a valid point location provided on the roadbed indicated. |
| 2169.1 | Right Turn Lanes is required for route sections with Functional System in ( Interstate, Principal Arterial - (Other Freeways and Expressways), Principal Arterial - Other, Minor Arterial, Major Collector) that are within an Urban/Urbanized Area, and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2169.2 | If exists, must be 1 if no Intersection point events exist along the same extents. |
| 2169.3 | If exists, not be 1 when Intersection point events exist along the same extents. |
| 1024.1 | On Route DFO must be within the extents of the On-route indicated. |
| 2221.1 | Intersecting Roadbed DFO must be within the extents of the Intersecting Roadway. |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 1019.1 | At least one Intersecting Route must exist for each Roadbed Intersection. |
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |
| 1088.1 | Roadbed Surface is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1079.2 | Roadbed Width must be a value greater than or equal to 0. |
| 1079.3 | Roadbed Width is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1072.1 | Roadway design cannot be One-Way when Functional System |
| 1072.2 | Roadway Design is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2053.1 | Roadway Maintenance Agency is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |

| Message ID | Message Text |
|---|---|
| 1066.1 | Roadway Status is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 1067.1 | Roadway Status Date must be less than or equal to the current date. |
| 1068.1 | Roadway Closure Reason is required when the 'Temporarily Closed to Traffic' option is indicated for Roadway Status. |
| 1068.2 | Roadway Closure Reason must be null when the 'Temporarily Closed to Traffic' option is not indicated for Roadway Status. |
| 2113.1 | Roadway Closure Comment is only allowed when the Roadway Closure Reason is set to Other. |
| 2113.2 | Roadway Closure Comment must be less than 101 characters in length. |
| 2245.1 | Roadbed Type must be one of the following: 'K', 'A', 'B', 'X', or 'Y'. |
| 2245.2 | Feature Left/Right of Roadway must be indicated as related to ascending mileage direction. |
| 2147.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2147.2 | All Scenic Overlooks must have a valid point location provided on the roadbed indicated. |
| 2069.2 | Signal Type is required for all Urban HPMS Samples, and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2185.1 | Soil Type is required for all Paved (Surface Type in 1-11) HPMS Samples, and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2010.1 | STRAHNET is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2165.1 | STRAHNET approval date must be a valid date greater than 1990. |
| 2140.1 | Roadbed Type is required for Stream Crossing events. |
| 2140.3 | Intersecting Feature - Crossing Angle must be > |
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |
| 1042.1 | Street Directional Prefix is required if Street Name is not null. |
| 1043.2 | Street Name must be less than 41 Alphanumeric characters. |
| 1044.1 | Street Type is required for all Street records. |
| 2207.1 | Street Definition record is required when Ownership = 3 (City Maintenance) and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2}. |
| 2131.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2131.2 | Intersecting Feature - On Route Grade must be in (A, B). |
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |

| Message ID | Message Text |
|---|---|
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2182.1 | Terrain Type is required for all Rural HPMS Samples and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2151.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2151.2 | All Test Sites must have a valid point location provided on the roadbed indicated. |
| 2014.1 | Texas Trunk System routes must fall outside Urbanized area boundaries. |
| 2074.1 | Toll ID is required when Toll Charged is in (1, 2). |
| 1074.1 | Toll Charged is required on all routes where a toll exists. |
| 2158.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2158.2 | Toll Booth must be located on route with a Toll present. |
| 2158.3 | All Toll Booths must have a valid point location provided on the roadbed indicated. |
| 1075.1 | Toll Type must be in (1, 2) where toll charged is 1 or 2. |
| 2146.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2146.2 | All Tourist Information Centers must have a valid point location provided on the roadbed indicated. |
| 2154.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2154.2 | All Traffic Management Instrumentation must have a valid point location provided on the roadbed indicated. |
| 2150.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2150.2 | All Traffic Monitoring Sites must have a valid point location provided on the roadbed indicated. |
| 2069.1 | Signal Type Must be a value of No Signal Systems exist, if Number of Signals |
| 2129.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2129.2 | Intersecting Feature - On Route Grade must be in (A (Above), B (Below)). |
| 2129.3 | Intersecting Feature - Crossing Angle must be > |
| 2217.1 | On Route Structure Number is required when Intersecting Feature - On Route Grade is A (Above). |
| 2236.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2237.2 | Tunnel ID must be less than 51 characters in length. |
| 2153.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |

| Message ID | Message Text |
|---|---|
| 2153.2 | All TXDOT Facilities must have a valid point location provided on the roadbed indicated. |
| 2056.1 | Usual ROW Width Can't be less than Minimum ROW Width. |
| 2056.2 | Usual Right of Way Width is required and is missing for a portion of this Route at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2056.3 | Usual ROW Width must be Numeric value greater than or equal to zero. |
| 2126.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2126.2 | Feature Notation is required for all Utility features. |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2260.1 | Vertical Grade is required for all HPMS Samples where Surface Type is in 1-11 (paved) and Functional System is in (1,2,3) (Interstates, Principal Arterials), and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2260.2 | Vertical Grade is required for all Rural HPMS Samples where Surface Type is in 1-11 (paved) and Functional System |
| 2260.3 | Required for all Vertical Grade event records. |
| 2260.4 | Required for all Vertical Grade event records. |
| 2260.5 | Required for all Vertical Grade event records. |
| 2260.6 | Vertical Grade Percent must be > |
| 2260.7 | Vertical Grade Length must be a numeric value with 2 or less digits of precision. |
| 2260.8 | Sum Length of all Vertical Grade records for a HPMS Sample must equal the HPMS Sample length. |
| 2260.9 | Sum Length of all Vertical Grade Percent records for a single HPMS Sample ID must equal the HPMS Sample length with the same HPMS Sample ID. |
| 2133.1 | Roadbed Type must be one of the following: 'K', 'R', 'L', 'M', 'S', 'P', 'T', 'A', 'B', 'X', or 'Y'. |
| 2133.2 | Waterline Crossing - Crossing Feature Grade must be in ('Above Grade','Below Grade'). |
| 2133.3 | Intersecting Feature - On Route Structure Number is required if Intersecting Feature - Crossing Feature Grade |
| 2218.1 | Intersecting Feature - Crossing Angle must be > |
| 2180.1 | Widening Obstacle is required for all HPMS Samples, and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2181.2 | Widening Potential must be an Integer greater than or equal to zero. |
| 2181.3 | Widening Potential is required for all HPMS Samples, and is missing at location: BeginDFO: {0} EndDFO: {1} Roadbed: {2} |
| 2097.1 | Year of last construction is required when Surface Type is paved (1-11) and HPMS Sample ID is not null. |

| Message ID | Message Text |
|---|---|
| 2097.2 | Year of last construction must be valid positive integer. |
| 2097.3 | Year of last construction must be less than next year. |
| 2094.1 | Year of last improvement is required when Surface Type is paved (1-11) and HPMS Sample ID is not null. |
| 2094.2 | Year of last improvement must be valid positive integer. |
| 2094.3 | Year of last improvement must be 0 or greater than 1988. |
| 2094.4 | Year of last improvement must be less than next year. |

# Appendix C: RAI Asset Information

| Data Group | Asset Name | Line/Point | TPP Maintainer | TPP Reviewer | Non TPP Maintainer | Non TPP Reviewer | Non TPP Creator/ |
|---|---|---|---|---|---|---|---|
| Administrative | Access Control [FE* SP*] | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | Date Closed To Traffic | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | Date Opened To Traffic | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | Functional System [FE + R] | Line | Yes | Yes | No | No | Yes |
| Administrative | Government Control | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | HPMS Sample [SP] | Line | Yes | Yes | No | No | Yes |
| Administrative | Memorial Highway | Line | Yes | Yes | No | No | Yes |
| Administrative | Multiple Modal Facility | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | NHS | Line | Yes | Yes | No | No | Yes |
| Administrative | Ownership [FE] | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | Reservation | Line | Yes | Yes | No | No | Yes |
| Administrative | Roadway Maintenance Agency | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | Roadway Status | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | STRAHNET | Line | Yes | Yes | No | No | Yes |
| Administrative | Texas Trunk System | Line | Yes | Yes | No | No | Yes |
| Administrative | Truck Route | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | TxDOT Facility | Point | Yes | Yes | Yes | Yes | Yes |
| Administrative | Year of Last Construction [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Administrative | Year of Last Improvement [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| All | Acceleration/Deceleration Lane | Line | Yes | Yes | Yes | Yes | Yes |
| All | Administrative Boundary Override | Line | Yes | Yes | No | No | No |
| All | Alternate Route [FE] | Line | Yes | Yes | Yes | Yes | Yes |
| All | Base Thickness [SP] | Line | Yes | Yes | Yes | Yes | Yes |

| Data Group | Asset Name | Line/Point | TPP Maintainer | TPP Reviewer | Non TPP Maintainer | Non TPP Reviewer | Non TPP Creator/ |
|---|---|---|---|---|---|---|---|
| All | Bicycle Route | Line | Yes | Yes | Yes | Yes | Yes |
| All | Causeway [FE] | Line | Yes | Yes | Yes | Yes | Yes |
| All | Control Section | Line | Yes | Yes | Yes | Yes | Yes |
| All | Demand Based Toll Price | Line | Yes | Yes | No | No | Yes |
| All | Evacuation Route | Line | Yes | Yes | Yes | Yes | Yes |
| All | Hazardous Route | Line | Yes | Yes | No | No | Yes |
| All | Maintenance Section | Line | Yes | Yes | Yes | Yes | Yes |
| All | National Forest Highway | Line | Yes | Yes | No | No | Yes |
| All | Number of Stop Sign [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| All | Parkway | Line | Yes | Yes | No | No | Yes |
| All | Pavement Thickness Flexible [SP] | Line | Yes | Yes | No | No | Yes |
| All | Pavement Thickness Rigid [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| All | Pavement Treatment | Line | Yes | Yes | Yes | Yes | Yes |
| All | Peak Direction Toll | Line | Yes | Yes | Yes | Yes | Yes |
| All | Present Serviceability Rating [SP*] | Line | Yes | Yes | Yes | Yes | Yes |
| All | Reference Marker | Point | Yes | Yes | Yes | Yes | Yes |
| All | Right Turn Lane [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| All | Roadbed Surface [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| All | Route Definition | Line | Yes | Yes | Yes | Yes | Yes |
| All | School Zone | Line | Yes | Yes | Yes | Yes | Yes |
| All | Stream Crossing | Point | Yes | Yes | Yes | Yes | Yes |
| All | Street Definition | Line | Yes | Yes | Yes | Yes | Yes |
| All | Test Site | Point | Yes | Yes | Yes | Yes | Yes |
| All | Texas Travel Trail | Line | Yes | Yes | No | No | Yes |
| Cross Section | Boundary Crossing | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Bridge [FE] | Line | Yes | Yes | Yes | Yes | Yes |

| Data Group | Asset Name | Line/Point | TPP Maintainer | TPP Reviewer | Non TPP Maintainer | Non TPP Reviewer | Non TPP Creator/ |
|---|---|---|---|---|---|---|---|
| Cross Section | Cattle Guard | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Cemetery | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Climate Zone [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Climbing/Passing Lane | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Counter Peak Lane [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Crossover | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Culvert | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Driveway | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Ferry | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Fire Plug | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Gate | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Historical Marker | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | HOV Facility [FE] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | HOV Lane [FE] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Inside Curb | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Inside Shoulder [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Inside Shoulder Use | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Inside Shoulder Width [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Lane Width [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Left Turn Lane [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Litter Barrel | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Material Stock Pile | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Median [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Median Width [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Minimum ROW Width | Line | Yes | Yes | No | No | Yes |
| Cross Section | Number of Through Lanes [FE + R] | Line | Yes | Yes | Yes | Yes | Yes |

| Data Group | Asset Name | Line/Point | TPP Maintainer | TPP Reviewer | Non TPP Maintainer | Non TPP Reviewer | Non TPP Creator/ |
|---|---|---|---|---|---|---|---|
| Cross Section | Other Intersect Feature | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Other Roadside Feature | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Other Roadway Feature | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Outside Curb | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Outside Shoulder [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Outside Shoulder Use | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Outside Shoulder Width [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Overhead Sign | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Peak Lane [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Pedestrian Passageway | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Picnic Area | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Pipeline Crossing | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Railroad Crossing | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Rest Area | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Roadbed Intersection | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Roadbed Width | Line | Yes | Yes | No | No | Yes |
| Cross Section | Roadside Structure | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Scenic Overlook | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Soil [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Telephone Line | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Toll [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Toll Booth | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Toll Lane [FE] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Tourist Information Center | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Traffic Management Instrumentation | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Traffic Monitoring Site | Point | Yes | Yes | Yes | Yes | Yes |

| Data Group | Asset Name | Line/Point | TPP Maintainer | TPP Reviewer | Non TPP Maintainer | Non TPP Reviewer | Non TPP Creator/ |
|---|---|---|---|---|---|---|---|
| Cross Section | Transmission Line | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Tunnel [FE] | Line | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Usual ROW Width | Line | Yes | Yes | No | No | Yes |
| Cross Section | Utility | Point | Yes | Yes | Yes | Yes | Yes |
| Cross Section | Waterline Crossing | Point | Yes | Yes | Yes | Yes | Yes |
| Geometric | Baseline Bearing | Point | Yes | Yes | No | No | Yes |
| Geometric | Curve | Line | Yes | Yes | No | No | Yes |
| Geometric | Curve Class [SP*] | Line | Yes | Yes | Yes | Yes | Yes |
| Geometric | Roadbed Base [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Geometric | Roadbed Elevation [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Geometric | Roadway Design [FE + R] | Line | Yes | Yes | Yes | Yes | Yes |
| Geometric | Terrain [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Geometric | Vertical Grade [SP*] | Line | Yes | Yes | Yes | Yes | Yes |
| Geometric | Widening Obstacle [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Geometric | Widening Potential [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Operations | Alternate Speed Limit | Line | Yes | Yes | Yes | Yes | Yes |
| Operations | Maximum Speed Limit [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Operations | Minimum Speed Limit | Line | Yes | Yes | Yes | Yes | Yes |
| Operations | Number of Signal [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Operations | Peak Parking [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Operations | Percent Green Time [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Operations | Percent Pass Sight Distance [SP] | Line | Yes | Yes | Yes | Yes | Yes |
| Operations | Traffic Signal [SP] | Line | Yes | Yes | Yes | Yes | Yes |

# Glossary

| Term | Definition |
|---|---|
| **Baseline Bearing** | Documents the compass heading of each straight route segment and the relative location of the baseline used to derive directions and measurements. |
| **Bridge Number (NBI)** | Also known as a Structure Number. A 14 character alphanumeric id required on all spans of 21' or more.<br>DICOUCTRLSCNBR example. 142270683-04022<br>DI = Structure-District; valid codes are 01-25<br>COU = Structure-County; valid codes are 001-254<br>CTRL = Structure-Control; valid codes are 0001-9999<br>"-" = Hyphen<br>SC = Structure-Section; valid codes are 01-99<br>NBR= Structure-Number; valid codes are 001-999 |
| **Boundary** | A line or area separating geo-political units, i.e. District lines, County lines, City limits, MPO area, Urban Area, State line. |
| **Collector** | A street that provides connectivity between an arterial and local streets. The main street into a subdivision is typically a collector. |
| **Connector** | Moves traffic from the mainlane of one route to the mainlane of another route. A connector can also move traffic from the frontage of one route to the frontage of another route; or off-system to on-system or visa versa. |
| **Control-Section** | The **Control** is a four digit identifier which indicates a segment of roadway corridor . A general are from a city or town to another city, town or major intersection. The **Section** is a two digit identifier which breaks the Control into smaller segments. The control section can break at a county line, a major highway intersection, a river, stream or another logical location. |
| **Control-Section-Job (CSJ)** | The CSJ number is a unique, identifying nine-digit number of a roadway project. Under this format, a combined **Control-Section** number represents the particular section of highway, and the **job number** reflects the serial number of the let project.. Construction plans at TxDOT are organized by the control, section, and job number. |
| **Crossover** | A paved area in a median of a divided highway where traffic is allowed to cross over to the other side of the highway. |
| **Culvert** | Any pipe, duct or structure to facilitate drainage or transfer of surface water, storm water or other forms of runoff water and is an intersection feature of the roadbed. |
| **Distance from Origin (DFO)** | Is the measure along a route from the absolute begin of the route. A Linear Referencing System. |

| Term | Definition |
|---|---|
| **Divided Highway** | A roadway that has a median or some other physical barrier separating the two opposing sides of traffic. |
| **Freeway** | A road designed for high-speed traffic with controlled-access and grade-separated intersections. Contrary to popular belief, a freeway is not a road free from tolls, but rather a road that is free from signals and intersections; a "free-flowing" road. Indeed, when one uses the term freeway, it conjures images of a certain type of road based on its functional capabilities, and, in fact, most tollways are functionally-classified as freeways. |
| **Frontage Roads** | A road that runs parallel to a freeway or expressway for the purpose of providing access to adjacent properties and intersecting surface streets. Typically, there will be a frontage road on each side of a freeway. Frontage roads can be one-way or two-way. |
| **Grade-separated** | A intersection of two roads where one roadway passes over the other. In other words, the roads do not intersect at-grade. Every intersection along a freeway is grade-separated. |
| **Geometrics** | Attributes that describe a change in the direction of a highway (i.e. bearing and curves). |
| **GRID** | Geospatial Roadway Inventory Database |
| **High Occupancy Vehicle (HOV) lane** | A dedicated lane for vehicles that have a certain number of occupants, typically 2 or more. |
| **Highway** | Technically, a highway is any public roadway. Typically, the term highway is generally used to refer to a major roadway, usually maintained by the state. |
| **Highway network** | A total system of highways, roads, streets, bridges, tunnels, and related facilities, including all toll facilities, regardless of financing. |
| **HPMS** | Highway Performance and Monitoring System |
| **Interchange** | A grade-separated junction of two roadways with full or partial access between them. Technically, the term "interchange" can refer to a junction between a freeway and a surface street, but typically the term is reserved for freeway-to-freeway intersections. |
| **Loop** | In Texas, a loop is a state highway that connects two or more other state highways. Usually, a loop is circular in nature, but frequently is not. |
| **Managed Lane** | A lane or set of lanes on a road, typically on a freeway, that is separated from the general-purpose mainlanes by barriers, to which access is regulated by some means or criteria (typically tolls) to maintain a certain level of service. |
| **Mainlanes** | The main or primary travel lanes on a freeway or other highway, typically as opposed to frontage road or auxiliary lanes. |

| Term | Definition |
|---|---|
| **Median** | The reserved area that separates opposing lanes of traffic on divided roadways, such as divided highways, dual carriageways, and freeways. The term also applies to divided roadways other than highways, such as some major streets in urban. |
| **Parkway** | A roadway that typically runs through a park-like setting. |
| **Railroad Crossing Number** | A seven character alphanumeric consisting of six numbers and one letter.<br>NNNNNNA ex. 435621H |
| **Ramp** | A segment of pavement that provides a connection between two other roads. |
| **Reference Marker** | TxDOT derives Reference marker numbers by imposing a grid on a map of Texas. Grid axes are set on extreme western and northern points, where numbering begins with ten. The first reference marker numbers match approximate grid locations. Subsequent marker numbers increase by two. Numbers increase north to south and west to east, depending on the highway's general direction (except north-south interstates, where numbers increase south to north). The numbers are continuous from beginning to end across the state and do not start over at county lines.<br><br>The physical makers are:<br>• 3” x 10” x 5/8" green reflective panels<br>• 3” x 12” x 5/8” green reflective panels when reference marker number includes a suffix<br>• 2" tall numbers and letters that are series D, white engineer-grade, pressure-sensitive sheeting<br><br>only capital letters |
| **RHINO** | Roadway Highway Inventory Network Offload.<br>This file contains On and Off System roadway information. |
| **Secondary Route** | An additional designation given to any state maintained route, i.e. National Forest Highway, Texas Travel Trail, Bicycle Route, Evacuation Route. |
| **State-maintained** | Any roadway built and maintained by the state. |
| **Shoulder** | The paved or unpaved edge of a roadbed that is outside the striping of a through lane. |
| **Roadbed Surface** | The driving surface of a roadway; paved or unpaved. |
| **Surface Width** | Total width in feet of drivable paved surface for a roadbed including flush paved medians and continuous left turn lanes. |
| **TPP** | Transportation Planning and Programming Division |

| Term | Definition |
|---|---|
| **Turnaround** | A ramp that allows traffic to make a U-turn across a divided highway. In Texas, turnarounds are used predominately to allow traffic to go from a one-way frontage road on one side of a freeway to the opposing one-way frontage road on the other side of the freeway without having to traverse the intersections for the cross street. |
| **TxDOT** | Texas Department of Transportation |